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#1 GUIDE TO THE ATARI ST

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On Disk:

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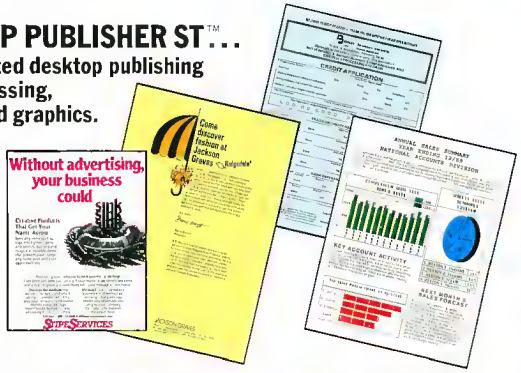

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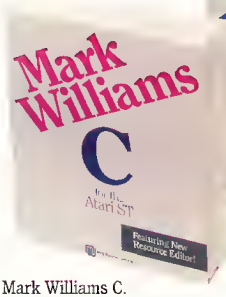

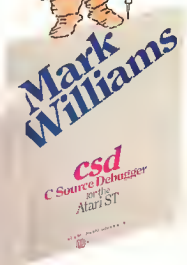

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START®

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Editorial

The ST/Mega line is maturing. The days of the single-sided floppy drive are behind us, as Atari has now upgraded the 520STFM to include a double-sided drive. Hard drives are becoming much more available, and with the mature software base, more desirable than ever. Third-party vendors are becoming more and more creative in filling the needs of ST/Mega users.

In this issue of START, we explore some of the new ST/Mega hardware developments that can only happen with a mature, capable machine. On the cover and in the companion article, **The BIG Picture**, you'll see one of the most remarkable developments in the history of the ST/Mega line. Moniterm has produced a 1280-by-960 pixel high resolution monochrome monitor that will knock your eyes out. And ISD, Inc. has produced some high-powered software to take advantage of it. Check out Dave Edwards' preview of DynaCADD to see the future of ST/Mega software.

Another indication of the ST's maturity is the breadth of available peripherals. David Plotkin leads off our special **Hard Drives** section by comparing and contrasting five major brands of hard drives, including some new and unusual types you may not have seen before.

Many STers started out as hackers a few years ago and there's still a lot of hacker blood flowing in our veins. Some manufacturers still try to satisfy the hacker's needs by, for example, selling peripherals in kits. Stephen Mortimer, START's newest Contributing Editor, built one of the new ICD FA-ST drive kits; he tells you of the profits and pitfalls this issue. Finally, to round out our Hard Drive coverage, Dave Small lays the theoretical groundwork for some of his upcoming hard disk tools in his column, **Small Tools**.

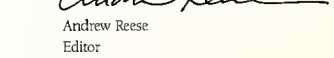
We've also included in this issue a review of Practical Solutions' new Video Key, their long-awaited video converter, and a review of Ricoh's workhorse laser printer by START's former Senior Editor Frank Hayes.

On the START disk this month, you'll find a couple of early Christmas presents. First, Alex Leavens' inimitable humor bursts forth in **Wombats II**, the fabulous sequel to the 8-bit text adventure classic. Then there's **Santa** BBS to let your kids "talk" to Santa over a simulated bulletin board (but don't tell them it's simulated—they'll never know). Plus, to expand your educational horizons, there's **Discovery Construction Set** written by START Programs Editor Heidi Brumbaugh.

For the programmers among us, we've included **See Sorts**, Delmar Searles' excellent graphic explanation of sort routines, and two excellent GFA BASIC programming aids in the **Programming in BASIC** column. All are on your START disk.

Beginning next month, START will add a new dimension to our ST coverage. Andre Willey, Technical Editor of England's Atari ST Magazine, will begin his START exclusive **European Report**. In it, you'll learn the latest news from the hotbed of ST development. Watch for it to see the shape of things to come.

Finally, we at START want to wish all of you a Happy Thanksgiving . . . and peaceful holiday shopping. ■



Andrew Reese
Editor
START, The #1 Guide to the Atari ST

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Dialog Box

Letters From Our Readers

Thanks For Going Monthly

This is my first letter to you, and what, you may ask, is the occasion? The announcement that START is going monthly.

I have been buying START since the second issue and, by gum, I will continue to buy each and every issue, even if I have to stop buying all other computer magazines. START is by far the most professional of all the magazines devoted to the Atari ST, and this is the main reason for my loyalty to you.

Now, besides congratulating you on your increased frequency, I have some questions. Here goes:

1. Is it possible to use a standard VCR as a mass storage device, hooked up to the MIDI In/Out ports? I've heard some strange and wonderful things about those ports.

2. The ReSTART TSR utility doesn't work with my STARTKey accessory. Why not?

3. How can I print out special characters, like the German umlaut, in ST Writer? I know about the deadkey function, but that just puts the character on the screen. When I try to print the file the character gets omitted. I always considered my printer to be quite Epson compatible, but nothing I do seems to work. I am aware of a rudimentary character translation table, but that doesn't do me any good either, since I must substitute one character with several, enabling the international character set, then disabling it again in order not to lose any English characters. Since I write frequent correspondence to Europe, ST Writer's inability to print out special characters is the one reason I never use it.

Thanks for helping me out. Again, congratulations for going monthly. And by the way, when you get a chance you ought to check out a new program called Flexcessory. It's distributed by E. A. Brown Company in Minnesota. I think it's the best desk accessory ever developed.

Christoph L. Herd
Colorado Springs, CO

1. It's technically possible to hook a VCR up to a computer and use it as a tape backup system; one such product is Central Computer Product's Videotrax. Unfortunately, that system only works with IBM PC's, PC clones and PS/2s. The company has plans to release a version for the Macintosh, but at present isn't planning anything for the ST.

2. We've also received a complaint that ReSTART is incompatible with MichTron's Alt utility. Somehow the programs are stepping on each other, but we're not sure exactly ▶

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Dialog Box

how. STARTKey will work fine if ReSTART is installed, but Alt gives up the ghost. ReSTART doesn't work in either case. ReSTART author Tom Hudson is looking into the problem.

3. According to Bruce Noonan, if your printer really is Epson-compatible it should have a DIP switch which will switch from a 128=character set to a 256=character set—which includes the foreign letters. If that's the case, you don't need to do anything to the printer configuration file; simply invoke the alternate character set by pressing Alternate X, then the character you want, then Alternate X again to return to the English set.

If you need to edit the character translation table, try assigning foreign keys to characters you don't use very often, such as the tilde or caret.

Finally, there is a roundabout way to send printer codes to the printer: Define a key (again, one you don't use very often such as the tilde) in your printer configuration table as the Escape key. When ST Writer encounters this code while printing, it will send a code to the printer. For example, to send the printer Escape B you would type ~B. ... Ed.

Byte Mechanic Appreciated

I'm writing to express my appreciation of the Byte Mechanic program presented in Special Issue #4 of START. It was exactly what I needed to convert a client's file for import into Publishing Partner.

The file had been prepared using a combined spreadsheet and word processor on a PC clone. It contained control codes, multiple spaces and tabs, and the like.

Other programs allow me to view these codes and edit them by overtyping. But this is tedious and does not allow replacement of unequal-length strings. Conversely, text editing programs do not easily allow entry of non-ASCII codes such as **$7F** and **$FE**.

Byte Mechanic gave me the flexible search-and-replace facilities I needed to fix up the file quickly (and profitably). It's friendly, too—I can specify characters either in hex for the codes or by typing (for the multiple spaces). In short it's ideal for pre-DTP file treatment.

START is quite expensive here in the U.K., but it's certainly good value for the money.

Martyn Dryden
Dorset, England

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Or leave us a message on CompuServe using the Antic Online Mailbox—just log on and type GO ANTIC.

Alert Box

Igor Help Key Mishaps

The Igor program (Summer 1988 issue of START), came with a macro file for STARTKey that should let you invoke Igor by pressing the Help key. Unfortunately, this macro is affected by the bug in STARTKey mentioned in the Spring 1988 issue. The macro won't work until you remove the line **the_appl=0**, which is located inside the first **if** statement of the procedure **send_message()**. Recompile the program, using the header files on the Winter START disk.

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Products Update

New ST Software and Hardware

Jet

Jet from SubLogic puts you at the controls of one of the most advanced tactical fighter aircraft in the world: an F-16 Fighting Falcon. Or you can climb into the cockpit of a carrier-based F-18 Hornet, the Navy's newest multi-role jet fighter. Both jets use fly-by-wire flight systems for fast, accurate response to your control input.

SubLogic's new program Jet puts you at the controls of one of the most advanced tactical fighter aircraft in the world: an F-16 Fighting Falcon.

Jet includes a free-flight non-combat mode and offers a variety of target-strike or aerial dogfight options to test your skills under different combat conditions. Optional scenery disks expand your flying environment and let you explore the world. With the multi-player option, you and a friend can fly together or engage in aerial combat via your ST's modem ports. Jet, $49.95. **SubLogic Corporation, 713 Edgebrook Drive, Champaign, IL 61820, (217) 359-8482.**

CIRCLE 181 ON READER SERVICE CARD

MT-240 Keyboard

The **MT-240**, the latest keyboard in Casio's "Tone Bank" series, is a 49-key, 10-note polyphonic keyboard including dual speakers with built-in stereo effects. Other features include the new 12-bit PCM instrument sound generator and 20 PCM instrument sounds with Tone Bank capability, giving you 210 possible sound combinations. The MT-240 has 20 rhythms that use 46 PCM sound sources and the Casio chord system that uses 16 sounds.

The MT-240 keyboard has a demo song built in and operates on either AA batteries (included) or an AC outlet. MT-240, $199.50. **Casio, Inc., 570 Mt. Pleasant Avenue, P.O. Box 7000, Dover, NJ 07801, (201) 361-5400.**

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Products Update

Fax/Modem Switches

High-Tech Resources has introduced three new automated fax/modem switches which are designed to prune phone costs by eliminating dedicated line installation and monthly charges—as much as $600 per year for each line.

Model V/F/M allows a fax machine or modem to share a voice line with exclusion that prevents barge-in. Features include a 24-hour auto-answer with preset rings. The **Model F/M/A** fax/modem switch listens for incoming fax tones. It's ideal for single-line or multi-line installations. Finally, the **Model M/F** fax/modem switch deciphers the incoming tones and connects the appropriate receiving device.

Each switch is completely compatible with all fax machines, dial modems and push-button phones. V/F/M, approximate retail $100-125; F/M/A, M/F FAX/Modem Switches, approximate retail $300-350. **High-Tech Resources, 4225 W. Glendale, #102, Phoenix, AZ 85051, (800) 422-2832.**

CIRCLE 183 ON READER SERVICE CARD

MidiDraw

Intelligent Music, which brought you the interactive music package M, has released **MidiDraw**, a new program for the ST that combines drawing and music-making in one package.

MidiDraw lets you compose and perform music by drawing on the computer's monitor. The program offers professionals a gestural approach to performance, yet it is instantly accessible and fun to use. With MidiDraw, you can perform on the ST as if you were playing a musical instrument. It can run on either a 520, a 1040 or a Mega. A MIDI synthesizer is required. MidiDraw, $95. **Intelligent Computer Music Systems, Inc., P.O. Box 8748, Albany, NY 12208, (518) 434-4110.**

CIRCLE 180 ON READER SERVICE CARD

Heroes of the Lance

SSI's **Heroes of the Lance**, the first Advanced Dungeons and Dragons computer action game for the ST, re-creates the epic battle between good and evil on the world of Krynn. You control eight characters, each with different specialized attributes and skills, and guide them through the treacherous ruins of the temple Xak Tsaroth to retrieve the precious Disks of Mishakal.

As your party descends into the Abyss, you must defeat the monstrous Draconians in hand-to-hand combat, deal with powerful magic and survive the onslaught of attacks from giant spiders, skeletal undead and countless other terrors. Ultimately, you must find the key to destroy Khisanth, the ancient black dragon who guards the platinum disks. Heroes of the Lance, $39.95. **Strategic Simulations, 1046 N. Rengstorff Ave., Mountain View, CA 94043, (415) 964-1353. For ordering call Electronic Arts, (800) 245-4525.**

CIRCLE 182 ON READER SERVICE CARD

Do you have a new ST product? If so, we'd like to hear about it. Please send your press releases and product photos to **Product Update,** *START, 544 Second Street, San Francisco, CA 94107* ■

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The Birth of

A Partial List of Features

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Multiple 3D views can be opened and modified at any time
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Automatic generation of ANY orthographic view including user defined auxillary views
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Full GEM interface, pull down menus, mouse or keyboard commands, dialog boxes and more.
256 Layers can be activated invidually or in groups
9 zoom modes allow magnification's of up to 1,000,000 times
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Auto Dimensioning includes;
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Baseline, chaining, angular and linear dimensioning is supported
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Text orientation using any one of the three different systems (uni-directional, angled or aligned)

Commands

Sophisticated command nesting allows the following partial list of commands to be accessed at any time:
Zoom in or out
Zoom a window
Scroll or "Pan" the page
Center the page on a point
Multiple 3 Dimensional dynamic rotations at any angular increment
Rotate any 3 Dimensional view to a predefined co-ordinate plane
Zoom a 3 Dimensional view in or out...

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Information Commands

DynaCADD gives you the ability to:
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Verify location and style
List database extents, drawing parameters...

Entity Transformation

Translation between 2D or 3D positions, circular arrays, mirror, linear arrays, stretch, sweep, rescale, project, revolve, trim and divide
3 Dimensional entity transformation of any view into 2 Dimensional entities
Select entities for transformation & editing using;
Digitize, Windows, Windows Out, View Windows or Last...
By entity color
By entity layer
By chaining with direction and much more

Plotter Output

Both HPGL and DM/PL and compatible plotters are supported
Plots can be generated at a constant 1:1 ratio or a drawing can be automatically scaled to any degree
Plotting extents can be defined using:
The drawing page
The current extents
A definable plotting window
The database extents
Plotter and printer output can be directed through the serial port, parallel port or to a disk file (ie; i/o redirection)

Printer Output

Laser Printers, draft and final mode
Epson and compatible printers are supported, both 8 and 24 pin
All drivers allow;
Quickplots, Final drafts utilizing the printers highest graphics mode, multi sheet prints, scaled and constant ratio prints

Data Transfer

DynaCADD reads and writes both DXF Entity and DXF Drawing Files
DEF File Format is included to insure upward compatibility to all versions on all micro computers
DynaCADD allows compatibility with the new Desktop Publishing solution, Calamus

System Requirements:

Atari 1040ST or Mega series, minimum 1 MByte of memory, 1 MByte disk drive and a Monochrome Monitor

Commitment to the Future

A modular design structure provides the basis for continued upward growth of the DynaCADD solution. A strong commitment to research and development and a world wide support mechanism combined with a young experienced dynamic programming team, are your insurance that the DynaCADD package will remain on the leading edge of CADD technology. Upgrade modules currently under development include surface design and image design, both with the same easy to use graphic interface of the DynaCADD base module.

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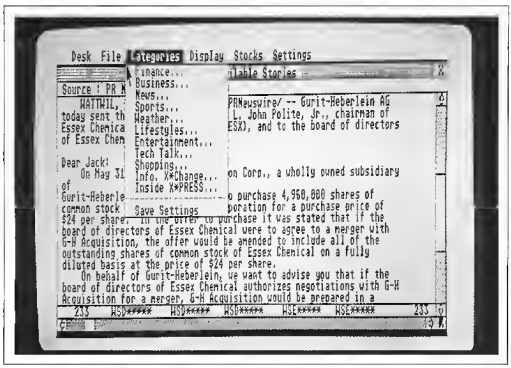
News, Notes & Quotes

What's Happening in the Atari World

by Stephen Mortimer
and the START Staff

*X*PRESS Delivers Affordable News*

X*PRESS is an electronic information service that has no hourly fees and does not tie up telephone lines. Delivered to your ST via an ordinary television cable, X*PRESS brings up-to-date news, weather and stock quotes 24 hours a day. A data receiver connects to the ST's RS-232 serial connector and converts the signals on the television cable into information that the X*PRESS software can understand.



X*Change is the basic service that requires no fees except the initial purchase of X*PRESS. It offers news from agencies across the world, including AP, Canadian Press and even the Soviet TASS. Sports information ranges from box scores, lineups and schedules to feature stories. Current weather reports, TV listings and syndicated columns can be found on X*Change. Byte Magazine offers Microbytes, Best of BIX (Byte Information Exchange) and one-way conferences. A personal stock portfolio is updated three times per day.

The Executive service offers business and financial news at the monthly price of $19.95 in addition to the basic kit. Stock quotes from both U.S. and Canadian stock exchanges are updated all day. Standard & Poor's, Business Week and McGraw-Hill provide extensive coverage of the business and financial world. Business Wire and PR Newswire press releases are available on the Executive service, in addition to foreign exchange and interest rates, commodities, precious metals, and mutual fund prices. Executive subscribers also have access to X*Change.

The X*PRESS software, written by Alan Page of Flash! fame, lets you select certain categories that you want placed automatically in a clippings folder that can be read or printed out at your leisure. You can specify keywords to search through all incoming stories. The software can operate in the background while another program is being used on the ST.

X*PRESS X*Change retails for $125 and the Executive service is $225 plus the $19.95 monthly fee. Both services include the TV cable to serial adapter. The X*PRESS information service is only available if your cable company carries it.

For more information, contact X*PRESS Information Services, Ltd. at 4643 South Ulster Street, Suite 340, Denver, CO 80237, (800) 772-6397 (7PC-NEWS).

News, Notes & Quotes

Atari Goes Vertical with DynaCADD

The Atari Mega is entering the vertical market arena in earnest with the advent of DynaCADD, a professional CADD application from ISD Marketing. Atari Canada is actively promoting the Mega and DynaCADD as a cost-effective CADD solution to value added resellers (VARs) and specialty retailers. The promotion uses the slogan "Birth of a New Breed."

One VAR, Geodetic Software Systems, is packaging the Mega and DynaCADD as a Logical Surveying Software package. It is being used in 85 land surveying offices in the province of Ontario, Canada. Many of the systems were sold before DynaCADD was even available. (Editor's note: *A preview of DynaCADD appears elsewhere in this issue.*)

Math Coprocessor for Megas

Atari has released the SFP004 Floating Point Coprocessor to developers. The card is available for the Mega's internal 68000 bus. Contained on the card is a 16 MHz Motorola 68881 floating point coprocessor (a 20 MHz chip is offered as an option). Applications are not affected by the coprocessor unless they are specially modified to take advantage of its capability. Before an application can use the SFP004, the language used to develop the application must be modified to handle object code compatible with the 68881. Performance of modified applications may be increased up to 20 times. Atari is working closely with suppliers of programming languages to ensure that they support the SFP004.

Moniterm, makers of large computer monitors, has included a 68881 socket on their high resolution monitor interface card which is installed within the Mega and is compatible with Atari's design. No date has been set for an official public release of the SFP004.

Fat Bits . . .

• Hewlett-Packard has charged Apple Computer with antitrust violations and unfair business practices in a countersuit filed in San Jose, California. The suit is HP's response to a lawsuit filed by Apple against Microsoft and HP. Apple contends that HP's NewWave and Microsoft's Windows 2.03 windowing environments infringe on Apple copyrights and resemble the Mac too closely. HP seeks to have the Apple suit dismissed and the Apple copyrights revoked. They charge that Apple was not the originator of windowing environments and that they misled the U.S. Copyright office into believing that Apple was in fact the sole creator. . .

• All new Atari 520 STFM computers are now equipped with built-in *double-sided* disk drives. . .

• The existence of a laptop ST, previously just a rumor, has been acknowledged by an Atari U.K. official in a British magazine. Supposedly it will be available by the end of the year and will use a trackball in place of a mouse. A price of under $1,500 has been rumored.

• Practical Solutions, maker of Monitor Master and Video Key, is considering producing MIDI Master if demand warrants. This device would switch between two sets of MIDI cables at the touch of a button and provide a MIDI Thru port. . .

• In addition to the 1280-by-960 monitor interface from Moniterm, a similar board is available from both France and Germany. Software drivers for the cards allow a detached menu bar to be called up anywhere on the screen. . .

• Atari's PCF-554 5¼-inch floppy disk drive for their PC clones also works with the ST. With a slight software modification, the drive will let the ST read and write IBM disks. . .

• Another upgrade to WordPerfect is available, dated August 1, 1988. It offers greatly increased scrolling speed and more bug fixes, according to Steve Reiser of WordPerfect Corporation. . .

• The Diablo 630 emulator for the Atari Laser has been updated and is now more compatible with third-party software. An Epson emulator is available from DMC in Germany and can be found at some dealers in the United States.■

Stephen Mortimer is a high school junior and a member of the National Honor Society.

If you've got a hot tip or an interesting product for the ST, we'd like to hear from you. Let us know at **News, Notes & Quotes, START, 544 Second Street, San Francisco, CA 94107.**

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—Wayne Holder,
President, FTL Games

	Laser C			Mark Williams C v3.0		
	Compile/ Link	Run	Error	Compile/ Link	Run	Error
Hello.c	2.43	—	—	15.98	—	—
Apskel.c	8.88	—	—	26.5	—	—
Sieve.c	4.59	2.45	—	23.9	2.77	—
AES	35.6	—	—	103	—	—
Savage	6.31	36.4	1.73×10^{-19}	30.82	83.0	1.18×10^{-7}

All times in seconds.
AES consists of nine source files totaling 1142 lines of code.
AES is built using Make.
Mark Williams C using RAM disk.

COMPILER:

One-pass generating relocatable code. Absolute addressing of globals allows program's code and data to be as large as memory allows. Ultrafast linker accepts both Laser C and DRI format object files.

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UTILITIES:

Resource Construction Program, full-featured Make utility, linker, dissassembler, archiver/librarian accept Laser C and DRI objects files.

LASER DB:

Source and assembly level debugger. Evaluate any C expression to print or set variables. Source and assembly mode allows interaction with compiler output. Disassemble or dump memory. Set breakpoints with the mouse on C lines or machine instructions. Watch C variables or machine registers. Multi-window user interface. Simple command structure.

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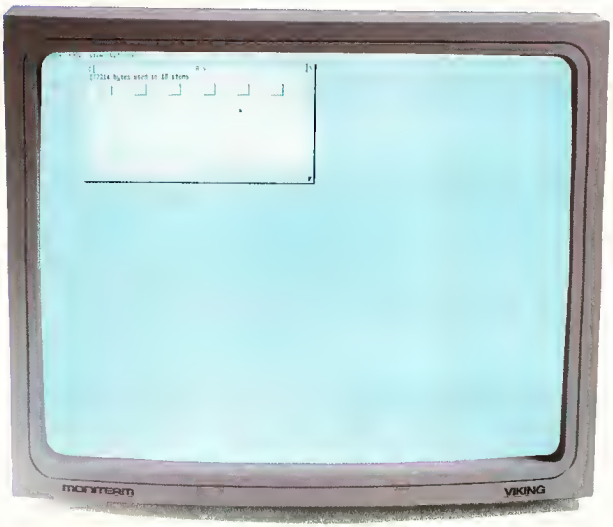
The BIG Picture

Moniterm's 19-Inch Mega Monitor

by Andrew Reese
START Editor



Tired of that old, small monochrome monitor? Are you setting up a CADD or DTP business? Or do you want the latest and greatest Mega toy there is? If your answer is yes to any of these questions, then you definitely want to save your nickels and dimes for a Moniterm Viking 19-inch monitor. It's amazing.

Moniterm and ISD, Inc. first demonstrated the Viking monitor with a Mega 4 at the Spring 1988 Comdex in Atlanta. It was running on a Mega 4 with a prototype adapter card ISD procured in Germany. Since then, with the cooperation of ISD and Atari, Moniterm has developed its own adapter board. We received a Viking 19-inch monitor and one of the first production adapter boards for this review and immediately set to work on our Mega 4.

Installation

The current monitor adapter boards, both ISD's and Moniterm's, can only be used with a Mega, since you need access to the Mega bus to pre-empt the video display hardware. The installation itself is easy—the board can fit in the Mega only one way and there's just a single cable that you can plug in only one direction (See *Figure 1*). To install the board, I removed the Mega's top cover, the floppy drive and the RF shield, then plugged the adapter board into the bus connector and the power cable into the auxiliary power connector. It was good that installation was so intuitive; as a very early production model, START's board came without any documentation.

The board itself is well-constructed and has a socket for a 68881 math coprocessor chip (See *Figure 2*). As of

presstime, there was no software available that had been rewritten to use the 68881, but it is encouraging to see that such sophisticated hardware is about to grace the ST market. One drawback: the adapter board takes up the only space available for Supra's internal MegaDrive hard drive, so simultaneous use is out.

Since ISD has been in the forefront of this development, their latest products have been designed to use the Viking monitor. DynaCADD (previewed elsewhere in this issue) is a professional-level CADD program and Calamus is a top-of-the-line DTP package, available in two strengths: Calamus for the 1040 ST user and Calamus Plus for professional DTP applications. And one other program is now compatible with the Moniterm monitor—Soft-Logik's Publishing Partner Professional.

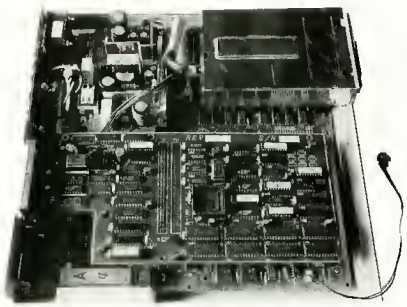


Figure 1. The Moniterm adapter board plugs easily into the Mega bus port. Once you manage to get inside the Mega, the rest is easy.

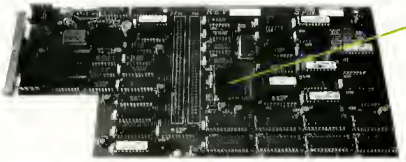


Figure 2. Moniterm has been kind enough—and smart enough—to include a socket for a 68881 math co-processor chip on their display adapter board.

A 1280-by-960 Pudding

But the proof, as they say, is in the pudding. The Viking pudding is 1280 pixels wide with 960 scan lines. Those dimensions are *twice* those of the Atari SM124 monochrome monitor and *four* times the area! As you can see in *Figure 3* and in the opening art, *left*, the difference is impressive. I had always been impressed with the sharpness, whiteness and size (compared to a Mac) of the Atari monochrome monitor. Next to the Viking, however, the Atari monitor looked yellowish and puny. The Desktop menu bar tucks up in the corner like an afterthought and a text directory listing can have three columns. This is one big monitor!

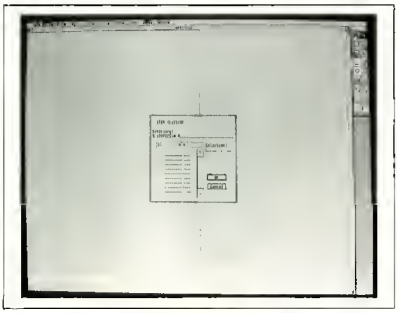


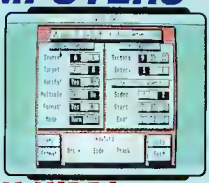
Figure 3. Publishing Partner Professional is one of the new wave of applications designed to work with the Viking Monitor. A crisp, readable two-page display is a snap when you have all those pixels.

Because Moniterm kept virtually the same resolution as the SM124 monitor, the sharpness and clarity of this big screen are outstanding. Moniterm adds an antiglare coating from Optical Coatings Laboratories, Inc. of Santa Rosa, California. It is highly effective in reducing reflected glare.

To use the Viking, you first have to boot up with special driver routines written by Atari for Moniterm. The Desktop

Figure 4. E. Arthur Brown's MouseBall II is the ideal way to skate from one side of the Viking screen to the other. The Viking has twice as many pixels across and twice as many down, making for some long mouse runs.

DATEL COMPUTERS



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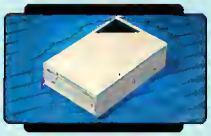

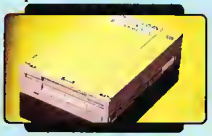

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then appears on the Viking and the SM124 is blank. You then use standard GEM practice to select and start programs, except that it's a *l-o-n-g* way to roll the mouse from one side of the monitor to the other. E. Arthur Brown's MouseBall II shown in *Figure 4* would come in very handy here.

Teething Problems

We had initial trouble with the ISD programs running with the Atari drivers, although Publishing Partner Professional booted on to the Viking flawlessly, despite PPP's history of early bugs. I had seen both ISD programs on the Viking at Comdex, so I knew they were compatible. Moreover, DynaCADD was expressly designed with switchable second monitor output.

After we reported the driver problems, ISD's programmers rewrote portions of the code, just in time to impress everyone at the Seybold Desktop Publishing Exposition in Santa Clara, California. Once the drivers were sorted out, there were no further problems and the Moniterm board was invisible to the system in normal use with Atari monitors.

The Viking is definitely *not* inexpensive. As of presstime, the exact pricing had not been determined, but it is in the rarified neighborhood of $2,400--almost enough to buy a Mega 4 system. But if you need the kind of resolution and display that the Viking provides, there's no substitute. And I'll sure miss it when we have to ship it back to Moniterm! ■

Products Mentioned

Viking 1 19-inch Monitor, tentative price at presstime $2,400. Moniterm Corporation, 5740 Green Circle Drive, Minnetonka, MN 55343-9074, (612) 935-4151.

CIRCLE 180 ON READER SERVICE CARD

MouseBall II, $39.95. E. Arthur Brown Company, 3404 Pawnee Drive, Alexandria, MN 56308, (612) 762-8847.

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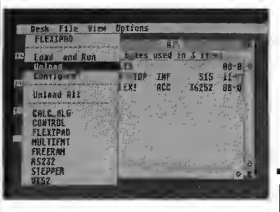

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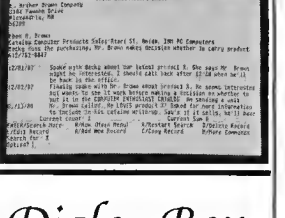
298-615 ST Findex V (S&H 2.50) $49.95



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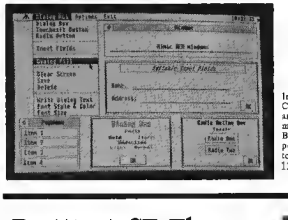
127-410 ST Flexcessory (S&H 2.50) $29.95



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Personal Publishing, September 1988

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DynaCADD

A START Preview

by Dave Edwards

DynaCADD is a powerful Computer-Aided Design and Drafting program distributed by ISD Inc., the people who brought VIP Professional and Calamus, the new desktop publishing program, to the Atari ST. The program offers ST users incredible features at a healthy price of $695.

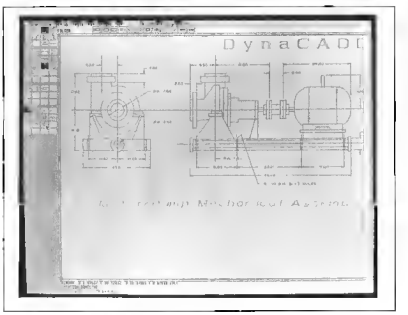
DynaCADD has a vast array of commands and is one of the best Atari CADD programs on the market. The program's icon-driven user-interface uses standard GEM features and helps you create extensive 2D and 3D CADD designs on 1040 STs or Megas. However, because of its size (over 500K), DynaCADD works best with a hard disk.

What You See

The DynaCADD package includes three floppy disks and a three-ring documentation binder. When you boot the program, the main screen prompts you to choose an active Part (a 3D database to use with DynaCADD) and an active Drawing (a 2D file). Activating a Part creates a folder on disk and your active drawing is placed in the folder, which could be a problem, considering the ST's current 40-folder limit. (Editor's note: *The new ST ROMS from Atari eliminate this problem.*)

This screen also asks for sheet size, drawing units and scale. The drawing units include feet, inches, meters, millimeters, etc.; the program also offers architectural dimensioning of feet *and* inches.

A CADD package should let you draw in real size and only worry about scale when producing the final output. However, DynaCADD makes you choose a sheet size and drawing scale up front. The sheet size might cause a problem if your design grows beyond your original intent.



DynaCADD is a powerful Computer-Aided Design and Drafting program by ISD, Inc. It offers ST users incredible features—at a healthy price.

Commands

The left side of the main screen consists of four sections containing sets of icons. For example, to place a line, I first select the Element Insert icon in the uppermost section. Beneath that section, another set of icons appears so you can determine what type of line to place. Finally, a set of icons appears beneath *that* section to help you select your input parameters. This inventive approach deserves a hearty round of applause.

All commands are chosen in a similar manner. If the program requires a num- ▶

ber for input, a calculator appears on-screen featuring trigonometry functions and various memory types. The View commands are accessed in icons just above the drawing area, separate from the other icons; since I use these commands often, I wouldn't want them two or three selections deep. There's also an upper row of GEM pop-up menus, file options and toggle switches of program values.

Maneuverability

Although icon-based CADD programs are hard to develop because of the number of commands involved, DynaCADD is very easy to work with. When you move the cursor over an icon, a message in the upper right corner tells you what the command does. A very complete set of CADD commands are included, rivaling just about any other CADD program on the market.

The 3D commands are straightforward and the system has an interesting way of choosing the object views. The program defines several planes for you to view from any angle. At present, you cannot shade or remove hidden lines on 3D objects, although ISD plans to release an upgrade to DynaCADD that will allow this. (Editor's note: *ISD plans to offer the free upgrade as an option to registered DynaCADD owners; it should be available by January.*)

DynaCADD works with dot-matrix or laser printers as well as small pen plotters. It uses a lot of memory when driving a laser printer, however; you may need more than a megabyte to output to a laser.

Nit-picking

To me, DynaCADD's biggest drawback is its copy protection scheme. I can understand that ISD wants to protect their considerable investment (after all, the program lists for $695). However, DynaCADD uses a hardware lock that plugs into the cartridge port. Since I'm a big fan of cartridge-based RAMdisks, I'm not fond of cartridge keys; a printer port lock would've been a better idea.

Conclusion

Overall, DynaCADD is an amazing product and one of the best ST CADD programs available. Its number of features is staggering—here, I couldn't touch on more than a few highlights. But I will give it a complete review (along with MasterCAD and GFA Draft) in an upcoming issue of START. ■

Dave Edwards runs a CAD consulting service and has written several CAD-related articles. When he is not writing about CAD, you will find him doing VersaCAD training. He is also a MIDI consultant, professional drummer and managing editor of "The MIDI Insider, The MIDI Power User's Newsource."

Products Mentioned

DynaCADD, $695. ISD Marketing, 2651 John St., Unit 3, Markham Industrial Park, Markham, Ontario, Canada L3R 6G4, (416) 479-1880.

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* **Compile** the script and then run it at any speed
* Stop playback, edit your script and run again - without quitting the controlled program (ST Control is a special desk accessory that can be entered even from non-GEM programs)

ST Control language features FOR-NEXT loops, IF..THEN statements, logical operators, subroutines, floating-point arithmetic, multi-dimensional arrays, arbitrary expressions, trig functions and much more. There's also a Trace function for real-time debugging of scripts. ST Control works on any ST, color or monochrome.

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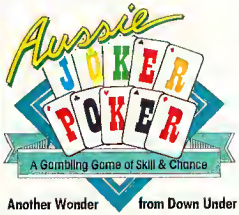

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WOMB

by Alex Leavens

Will Wally the Dragon get his moped tuned? Will Lord Kumquat deny denying his last denial? Will Chuckles the Clown ever get his funhouse renovated? On this issue's START disk, Alex Leavens takes one part lazy college days, one part Alice in Wonderland and a dash of Groucho Marx to brew up the witdest text adventure ever.

Chase wombats around the amniverse with WOMBATS2.ARC on your START disk!

A long time ago, there was Wombats I, a parody text adventure game for the Atari 800 computers which some people (about three) actually saw. It received rave reviews (well, okay, one rave review) and confused everyone who played it. Then there was Wombats II, which, aside from its two creators (myself and Shirley A. Russell), no one saw. This may have been a good thing, since it was an altogether weirder game—quite an accomplishment, considering how weird the first one was.

Well, I (immodestly) think you can't keep a truly good computer program down, so here is Wombats II for the ST. If we're all lucky, I'll do Wombats I next—proving once again that the last shall be first and the first last.

Playing The Game

Wombats II is a funny, strange and definitely bent text adventure (sorry, no graphics). The game will give you long descriptions of where you are and what you see; to play it, you type in short commands such as GO NORTH and READ BOOK.

I won't go into how the code works; for a detailed explanation of how to build a text adventure, check out my article "Parsers, Rooms, Objects and Trolls" in the Fall 1986 issue of START. (Editor's note: *That issue of START is sold out, but we will send you a photocopy of the article if you send a self-addressed, stamped, legal-size envelope and $1 to START Reprints, 544 Second St., San Francisco, CA 94107.*)

To play Wombats II, copy WOMBATS2.ARC and ARCX.TTP to a blank, formatted disk and un-ARC WOMBATS2.ARC, following the Disk Instructions elsewhere in this issue.

You begin Wombats II in the "Compass Room." From there you must find your way through other rooms, down subterranean passageways and across beaches. At times the Wombats II universe resembles our own; at other times it's more like Alice's Wonderland or a fantasy landscape out of *Dungeons and Dragons*.

Your job, if you choose to accept it, is to go around collecting things. Some things are treasures, worth 10 points if you can get them back to the "Compass Room" and drop them there. Don't assume that something isn't a treasure simply because it doesn't look like one. There are some very odd objects scattered about the rooms which have been designated as treasures (although only very small children and people who spend their time talking to trees might actually consider them valuable). Collect them anyway.

There are other things scattered around the universe; some do useful things, some don't. You'll never know which is which until you try. Periodically, you'll be awarded points for trying

ON DISK!

ATS II

things, or in some cases, *not* trying things. That's the fun of the game.

As I said, the Wombats II universe is very similar to our own, but that doesn't mean that the laws of physics are the same. Magic works (and often fails to work) in this universe, as do inspired guesses, low cunning and lucky breaks. You can get killed, although it's not easy and you *can* get reincarnated. Anything else?

Well, yes, but that's the whole point of the game. If I tell you any more it would be, well, telling. So I won't. Instead, I'll tell you how to talk to Wombats II.

Talking to the Game

When you want to tell Wombats II to do something, you'll type it at the prompt, which looks like this:

```
-->
```

You can give Wombats II a wide variety of commands to move around the universe, pick up or drop things, and a whole host of other possibilities which you'll have to discover for yourself. One type of command is <ACTION>, which tells the computer to do something. Examples are:

NORTH
SOUTH
SCREAM
YELL
BURP

Most action words are verbs, but some words, such as INVENTORY, NORTH, SOUTH, EAST, WEST, UP and DOWN *imply* a verb such as GO and can be used alone.

More complicated commands have the basic format of <ACTION> <DIRECT OBJECT>, where <ACTION> is what you want the game to do, and <DIRECT OBJECT> is what you want to do it to:

TAKE BOOK
EAT STRING
KILL DWARF

A more complex structure is: <ACTION> <PREPOSITION> <MODIFIER> <DIRECT OBJECT>. <PREPOSITION> is a standard preposition, such as *to* or *on*. <MODIFIER> is an adjective, such as red, and must match the direct object. (That is, if the game describes something as the small snail, then you can also refer to it as the small snail, or as just the snail. You may not refer to it as the slimy snail.) <DIRECT OBJECT> is again the object that you want the command to be performed on. Additionally, you may need to use the definite article *the* with a noun.

TAKE THE RARE BOOK
SIT ON THE COMFY BED
EXAMINE THE RED SHOES

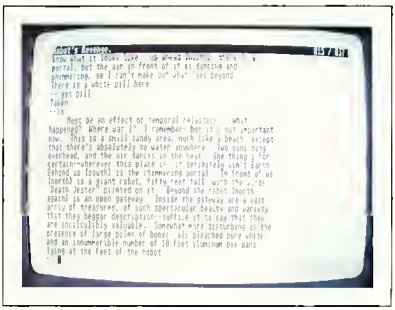
Some commands require both a direct object and an indirect object. For example:

GIVE THE BOOK TO THE SNAIL.
GIVE THE RARE BOOK TO THE SMALL SNAIL.
GIVE THE SMALL SNAIL THE RARE BOOK

are all equivalent (and valid) commands. You can also address the other inhabitants of the Wombats II universe, in the following fashions:

TALK TO <CREATURE>

where <CREATURE> is who (or what) you want to talk to. This is a general investigative command and will often elicit useful information. You can also ▶



Wombats II, START's first text adventure game. You type in commands telling where in the program you want to go and what to do. The game descriptions are so vivid you'll have little trouble visualizing your surroundings.

explicitly address one of the beings of the game and ask him, her or it questions about specific other things in the game:

<CREATURE>, TELL ME ABOUT <OBJECT>
<CREATURE>, WHAT ABOUT <OBJECT>

You may or may not find out anything useful this way; you'll find that the beings in the universe tend to know a lot about each other, and tend to be less interested in inanimate objects. Experiment!

Examples:

TALK TO THE BEE
GEORGE, TELL ME ABOUT THE RARE BOOK

Here's a short example of a series of commands to help you get a better idea of how to play. Words typed in capitals are your input to the game; words in upper- and lower-case are the computer's response.

You're standing in a very tiny room that appears to be best suited for holding clothes. There is a small snail here.

-->EXAMINE ROOM

There's nothing special about the room.

-->TAKE THE SMALL SNAIL

Taken.

-->INVENTORY

You are currently carrying:
a large piece of string
a small snail

-->GIVE THE LARGE PIECE OF STRING TO THE SMALL SNAIL

The snail is completely uninterested in the string.

-->TALK TO THE SNAIL

The snail doesn't have much to say.

-->EXAMINE SNAIL

It's a snail, what did you expect?

-->KISS SNAIL

Oooh, gross!

-->EAT SNAIL

You're joking!

-->SNAIL, TELL ME ABOUT THE STRING

"Eehehkens ehsnkes ehskesene."

And so on.

If you want to stop playing Wombats II and come back to your game later, save the game by typing SAVE or SAVE GAME. The computer will prompt you for a save position; enter a number between 1 and 9. To restore the game, type RESTORE or RESTORE GAME and the position number.

Syntax Errors

If you make a mistake typing in a command, Wombats II will tell you which word it doesn't understand or tell you which part of the sentence is incomplete. Here are the most common error messages.

- **I need a direct object!**
You didn't tell Wombats II what you were referring to. An example would be KISS THE, without specifying what you wanted to kiss.

- **I need an indirect object!**
In this case, although you specified the object that the action was to apply to, you didn't tell the game what object you wanted to be the recipient of the action. Example: GIVE THE BOOK TO THE.

- **I need an object with that modifier.**
You've specified the modifier of an object, but not the object itself. For example, TAKE THE RED.

- **That modifier doesn't go with that object.**
You specified a modifier that doesn't match the object in question. For example, if there are red shoes and blue socks in the game, and you said TAKE THE BLUE SHOES, you would get this error.

- **I don't know what a '<OBJECT>' is.**
You tried to talk about an object that the game doesn't recognize. If the game doesn't know what something is, it isn't important in playing the game.

- **I don't understand the command '<COMMAND>'.**
You tried a command that the game doesn't recognize. Try something else!

- **I don't understand that.**
The game is just basically confused about what you want it to do. Try approaching the problem from a different angle.

And Speaking of Snakes. . .

Well, the above should get you started. Have fun wandering around the universe. Oh, one other thing.

Watch out for the dragons.

(Editor's note: *Wombats I for the Atari 8-bit was originally supported by Dynamic Software Design; at present a limited number of these packages is available from San Jose Computer. This will* not *run on the Atari ST; you must have one of the older 8-bit computers.*■

Alex Leavens has been writing for START since his tutorial on writing text adventure games appeared in our second issue.

Product Mentioned

Wombats I for Atari 8-bit computers, $4.95. San Jose Computer, 640 Blossom Hill Rd., San Jose, CA 95123, (408) 224-8575.

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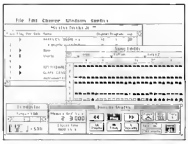

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A Look at PC Utilities

by Dovid Plotkin
START Contributing Editor

This month, we're going to look at some IBM PC utilities that will make your computing life easier. Next issue we'll jump back to the Magic Sac Macintosh emulator and discuss the Apple side of things *vis a vis* the Atari ST.

Switch Hitting

If you switch back and forth between ST and PC applications, you may have trouble remembering the commands necessary to run the PC applications. In fact, PC applications being what they are, I often find it difficult to remember the commands associated with them even when I don't switch back and forth.

InterSoft Publishing International's Command Tips series may refresh your memory. These programs are "terminate and stay resident" (TSR)—you run the program and then it effectively disappears, although it's still there in the background, waiting to be called (much like a desk accessory on the ST). When you need access to the program, you press a "hot key" combination and it appears on the screen. When you're done, press another set of keys and the TSR program disappears as if it had never been there. Your original application (or DOS) will then reappear and you can continue working.

TSR programs are virtually the only way a PC can call an application from within another one, and TSRs have some inherent problems. Various TSR programs can interfere with one another and lock up your keyboard, since the IBM PC wasn't originally designed to handle this type of program. The fact that pc-ditto handles them is a testimony to its emulation power.

The three programs in The Command Tips series are designed to provide information to PC users on applications, DOS and miscellaneous tables. Group WP1 shows the commands for word processors, including Wordstar, WordPerfect, Displaywrite 4 and Multimate Advantage. This package also includes DOS and DEBUG commands, an ASCII table, HEX table, Conversion tables and IBM Error Codes. Group DM1 shows the commands for spreadsheets and databases, including 1-2-3, Symphony, VP-Planner+ and dBASE III (it also includes the various miscellaneous tables in Group WP1). Finally, Group EX1 is for expert users and programmers. It includes commands for C, Assembly, Pascal, Quick BASIC, Fortran, BIOS and Interrupts, as well as the miscellaneous tables noted above.

Setting Up TSRs

Setting up Command Tips is quite troublesome. To install it, you must first un-ARC the program (remember, there are versions of ARC for many computers, and a version comes on the Command Tips disk). You can install the program on either a 1.2 megabyte high-density 5¼-inch disk (I don't believe any are available for the ST) or a hard drive. The final files are too large to fit even on a 3½-inch disk. Thus, unless you have a hard drive, you cannot use this series.

Annoyingly, if you *do* have a hard drive, the installation instructions don't work. What you have to do is create a new subdirectory called "CT" and copy the contents of the 5¼-inch disk into the subdirectory with the COPY command. Then you change to the new directory and type INSTALL, which will run the batch file. You will get an error message that the program can't open the CT directory (I don't know why not) but the program will be installed properly anyway. To run CT, just switch to the CT directory with the CD command, then type in CT. The program will run and you'll find yourself back at the DOS prompt.

To use CT, you must press the two ▶

Shift keys and the Alternate key simultaneously. This brings up a menu at the top of the screen. There appear to be two versions of the menu (one looks like that found in Lotus 1-2-3), and you can toggle between them using F3. The instructions (one 3-by-5 card!) don't mention this. With the arrow keys you can move the cursor to highlight the menu item for the program you want, then press Return to bring up the help page. There are multiple help screens for each topic (I counted over 40 screens for 1-2-3). You can change screens by typing in the number of the screen you want or by using the Page Down or Page Up keys (anyone know where they are?). When you're done, press the Escape key to return to your application.

Amazingly enough, the Command Tips series is of limited usefulness *because* it's so complete. By the time you page through each of the screens (with the screen loading from disk) looking for the information you want, it would be faster to look up the information in the manual or quick reference card. There is no way to key in a term you want to look for and have that screen brought up. Thus, this set of programs seems pretty expensive for what amounts to an in-memory version of what the program documentation provides.

The Norton Advanced Utilities

One set of utilities definitely worth its cost is the Norton Advanced Utilities. Ever since Peter Norton Computing released their first version, PC owners have been buying these at a record clip. There are numerous utilities included and Norton's Integrator program lets you run them from a main menu screen. It includes such useful programs as

TSR programs are virtually the only way a PC can call an application from within another one.

"Quick Unerase" which will unerase a program you've erased from a disk as long as you haven't written anything else on it. I once decided to erase all the files in drive A, so I typed:

```
ERASE A:*.*
```

Oops, I forgot the colon between the A and the first asterisk! As a result, *I erased every file on my hard drive (which was my current drive) beginning with the letter A!* With Quick Unerase, I recovered all those files in just a few minutes. Also included are utilities that can find a text string in any file on a disk, change file attributes, draw out on the screen the structure of the directories and subdirectories on your disk (very handy for a hard drive), allow for descriptions (up to 65 characters) for each file, print out an ASCII file with various printing controls, test the disk for damage, add the ability to obtain information from the user as part of a batch file, find a file on the disk and test for system performance (which returns a rather dreary number for an ST with pc-ditto—no offense).

Besides Quick Unerase, however, the most useful member of the Norton family is "Speed Disk." Much has been written about hard drives slowing down as they get full, and the files get fragmented—that is, when the various parts of the files are scattered all over the disk. You can use Speed Disk to analyze your hard drive and tell you how fragmented it is (you may be surprised). It can also automatically "unfragment" your disk, giving you a significant increase in access speed. If your disk is badly fragmented, this can take several hours, but it *is* worth it, and if you run Speed Disk periodically, it won't take as long each time.

A number of programs similar to Speed Disk have been advertised for the ST, but some nasty rumors have been floating around that they can trash your hard drive under certain circumstances. The Speed Disk program has been around for a long time, I've tested it extensively and it works on ST hard drives just fine.

That's it for our PC utilities. Next issue: back to the Mac! ■

David Plotkin is a chemical engineer for Chevron U.S.A. and is a long-time contributor to START and Antic.

Products Mentioned

Command Tips: Group WP1, $59.95; **Group DM1**, $69.95; **Group EX1**, $89.95. InterSoft Publishing International, 601 Brannan Street, San Francisco, CA 94107, (415) 777-2862.
CIRCLE 150 ON READER SERVICE CARD

Norton Advanced Utilities, $150. Peter Norton Computing, 2210 Wilshire Blvd., Santa Monica, CA 90403, (213) 453-2361).
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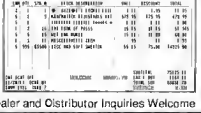

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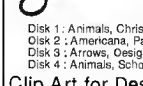

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by Albert Baggetta

Talk to Santa now and read stories about Christmas customs in other countries. File SANTA BBS.ARC on your START disk!

Did you ever see that magazine ad for shopping via modem? There's usually a woman at a computer terminal in a warm, futuristic living room. It's snowing outside her window as she orders a new winter coat through her online catalog.

As a kid, having lived through many of New England's winter nor'easters, I often had dreams like that. Around Christmastime I'd think, "Wouldn't it be great to have a direct line to Santa Claus? Then I could express my wishes and thanks to him directly from the privacy of my own room." (Remember now, this was in a time when the most available computer was a Univac.)

With a computer and modem you can call anywhere in the world and there are bulletin board systems and online services to meet every interest. You can do business transactions or shop at the Electronic Mall and yes, you and your child can even dial Santa direct, free of charge, with Santa BBS. (Note: Santa BBS is *not* a real telecommunications program. You don't need a modem to use it.)

He's Making a List and Checking It Twice

Santa BBS.ARC is even easy enough for an adult to use. First, un-ARC the file SANTA.BBS onto a blank, formatted disk following the Disk Instructions elsewhere in this issue. The file BBSTITLE.PIL *must* be in the same directory as SANTA.PRG. Double-click on SANTA.PRG. At the title screen, press the left mouse button or any key on the terminal to "dial" the Santa BBS. Sometimes the line's busy, so be patient. Eventually you'll hear a connect signal. Once you connect, the fun begins at a simulated 1200 baud rate.

Some Pointers

- Wait for prompts on the monitor screen. Press a key or the mouse buttons, or type in a response and then press Return. No bad language is allowed—Santa checks bad language as well as bad behavior, and if you're guilty of either, he'll put coal in your stocking (and maybe ignite it).
- Most scrolling text can be interrupted by holding down the Control key and pressing C.
- Exit the Santa BBS by selecting "Bye" from Santa's Menu.

Logging On

Enter your name (using a maximum of eight letters), which will be remembered for future sessions. Now you'll be notified of your time limit (15 minutes) and whether or not there's any important mail for you (from Santa, of course). If so, you can read it immediately. (You should – Santa's a busy guy.) You can delete your mail after reading it and since there's only a limited amount of space for messages, be sure to use this feature efficiently.

Next you'll see a message from Santa and the elves, followed by Santa's Menu. From here you can enter all of the assorted sub-boards on the BBS, using either the mouse or the keyboard. If you

click on the snowflake – the asterisk next to each entry – or press the corresponding key number, you'll be whisked off to the appropriate area.

The Santa Menu

Here's what the menu looks like:

```
Santa's Menu                                  15 Min. left
-------------------------------------------------------------
* <1> Christmas Customs
* <2> Santa's Survey
* <3> Read Survey
* <4> A Christmas Poem
* <5> Write Message to Santa
* <6> Read Messages
* <7> Rudolph's Number Game
* <8> Story Time
* <9> User File                          * <0> Bye
-------------------------------------------------------------
North Pole Express                          9 degrees
```

- Christmas Customs – this option shows you how other countries and cultures around the world celebrate Christmas.

- Santa's Survey – your chance to tell Santa all about yourself. The survey is saved under the name you logged on with. If you do another survey, it will replace your old survey.

- Read Survey – read what other users have said about themselves.

- A Christmas Poem – "The Night Before Christmas" in its entirety. The poem scrolls upwards a page at a time but you can interrupt the scroll and return to the main menu by pressing Control C.

- Write Message to Santa – you can write a 10-line message (or wish list) to Santa. (Actually, you can address a message to anyone.) When others log on to the board, they can list the messages in the READ MESSAGES area and look for any with their names. These messages are an "open book," so watch what you write. Parents take note: Santa's messages will be in the file N_POLE.MSG and are announced at log-on.

- Read Messages – these are posted to other visitors and to Santa. Select a message from the list that appears when you select this option.

- Rudolph's Number Game – you're invited to play a number-guessing game with Rudolph.

- Story Time – one of the more interesting sub-boards. One of Santa's elves invites you, with option A, to read an original story, "Winston the Winter Ant." You might have more fun, however, by choosing option B, which lets you "play" with the story, opening up a realm of unusual variations.

- User File – click here for a list of all the visitors on Santa's BBS.

- Bye – when you're finished with the board, press the Ø key or click on its snowflake to exit the board. If your time runs out, you'll be disconnected automatically.

That's It!

Well, there you have it. In the dead of winter, when the new-fallen snow covers the ground, or in the heat of summer, with the air conditioner failing to chill the stifling air, you and your children can be like that lady in the ad: using a computer to contact the world. However, you can take it one step further: you can communicate with a dream.■

Albert Baggetta is the author of "Haiku Poet" in the August 1987 issue of Antic Magazine.

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Review

The FA-ST Hard Drive Kit

Megabytes You Can Build Yourself

by Stephen J. Mortimer
START Contributing Editor

ICD is now offering the ST community a hard drive kit that has all the options of off-the-shelf drives. The FA-ST Kit comes in an MFM (Modified Frequency Modulation), RLL (Run Length Limited) or SCSI (Small Computer Systems Interface) configuration that depends upon the type of drive being used in the kit. MFM controllers use a very stable recording technique, although large capacity drives can be expensive. An RLL controller stores 50% more information on a drive than MFM, but requires a high quality medium. SCSI drives feature a universal interface that offers fast data transfers with a controller built into the drive.

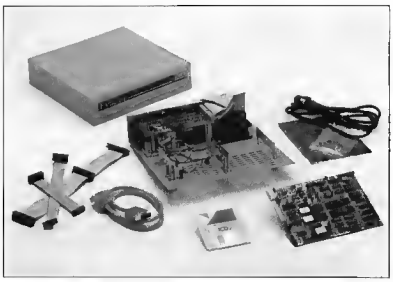


Figure 1: The FA-ST hard drive kit.

Getting Under the Hood

The drive version I review here uses the RLL variation of the FA-ST kit. It includes a drive case with fan, a hefty power supply, host adaptor board with a clock and an Adaptec 4070 RLL controller. The host adaptor offers a daisy-chain DMA port and a SCSI interface connector so you can connect other devices.

This FA-ST drive uses a Seagate ST-157R, RLL certified, 49-megabyte 3½-inch drive mechanism. It features auto-parking heads and a 28 millisecond average access time. The basic components of the kit shown in *Figure 1* and *Figure 2* were well made and relatively easy to assemble. The kit has provisions to package two 3½-inch drives side by side or one 5¼-inch drive. The ST-157R I assembled was in a 5¼-inch frame and was not compatible with the ICD mounting hardware for other 3½-inch drives. The larger 5¼-inch frame thus kept me from adding a second drive for additional capacity.

Driving On Manual

The kit provides two manuals to support the ICD components and the Adaptec controller. Unfortunately, the ICD manual is not specific to the FA-ST kit and adds some confusion to its assembly. On the other hand, the Adaptec manual is very useful in confirming the configuration of jumpers and terminating resistor packs. ICD is writing a new manual for the kit.

Assembling the kit was relatively easy, but I spent several hours of trial and error because of errors in the kit's manual. The manual stated that the metal shield should be attached to the top of the drive (see *Figure 3*) and the controller then mounted above this shield. Once I added the mounting brackets and controller board, I couldn't connect the cables easily without removing the controller and shield again (*Figure 4*). I discovered that plugging the cables onto the hard drive ▸

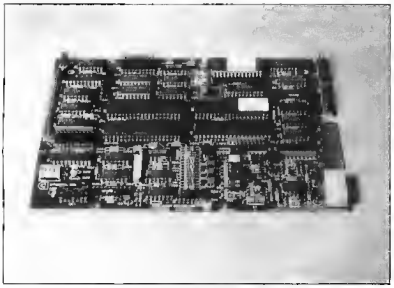


Figure 2: The Adaptec 4070 controller board.

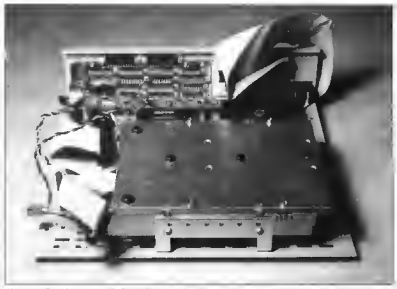


Figure 3: The metal shield over the actual hard drive mechanism. I could not connect the cables with this shield in place.

before installing the shield was much easier (see *Figure 5*).

In the case of the 12V DC power cable, I had to file the connector to eliminate interference between the power connector body and the drive casting and allow insertion in the socket. At this time, the LED on the case can be connected using the black jumpers provided (but not mentioned in the manual).

I recommend that you disconnect the "busy" LED on the drive itself to give maximum power to the LED on the FA-ST case and prevent the circuit from overloading. Finally, I put the shield back in place and then the controller. After this, the kit was easy to complete.

Formatting Software

The ICD formatting software supports most drives and controllers on the market today. With a little programming know-how, you should be able to write your own custom driver. The software supports formatting, zeroing the drive and hard disk autobooting. The ICD hard disk handler provides an automatic write verify with no speed degradation, confirming the reliability of the drive.

The ICD FA-ST kit is a solid, well-made hard drive unit and is a substantial asset to any ST owner. I'd like to thank the folks at ICD and Hard Drives International who provided the components for this review. ■

Stephen Mortimer is a high school junior and a member of the National Honor Society

Products Mentioned

ICD FA-ST Kit, $449.95 for an MFM kit, $499.95 for an RLL kit and $369.95 for an SCSI kit. ICD, Inc., 1220 Rock Street, Rockford, IL 61101, (815) 968-2228.

CIRCLE 210 ON READER SERVICE CARD

Seagate ST-157R, $399. Hard Drives International, 1208 East Broadway Road, Suite 110, Tempe, Arizona 85282, (800) 234-3475.

CIRCLE 211 ON READER SERVICE CARD

Figure 4: The metal shield removed and the drive cables plugged into the drive.

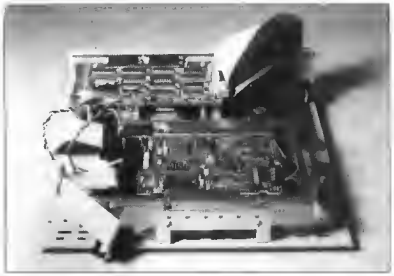
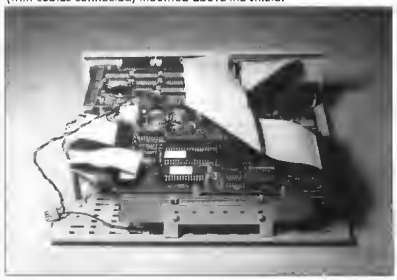


Figure 5: The final assembly. Here, you can see the controller board (with cables connected) mounted above the shield.



Review

The Indispensable Peripheral

Five Brands of ST Hard Drives Compared

by David Plotkin

Are you tired of swapping disks interminably? Do you fall asleep while your big applications programs are loading? Then you sound as if you're in the market for a hard drive!

High-powered applications such as spreadsheets, the Cyber series and desktop publishing place high demands on disk drive use and that means a lot of disk swapping (even with two double-sided drives) or a hard drive. Luckily for the ST user, the number of companies making hard drives for the ST has been increasing recently and drive sizes and options are now more generous than ever.

In deciding which hard drive is best for you, it's best to follow this rule: buy as big a hard drive as you can afford. You'd be surprised how fast a hard drive can fill up! But the software that comes with the drive, its built-in options, the size and shape of the case and the length of the connecting cable are also important. In some cases these factors may determine whether you can use a particular drive in your set-up at all. One thing you generally *don't* need to worry about, however, is the quality of the drive mechanism itself, because every manufacturer listed here uses high-quality drives made by such respected companies as Seagate and Miniscribe.

Astra's original HD+ has a 31-inch cable and a built-in 3½-inch floppy drive.

What I've tried to do here is to give you an overview of the ST hard drive market, concentrating on the factors you'll want to consider in your purchase decision. Not every drive could be covered, but I think you'll get a good overview of the market and be better able to make the right choice for you.

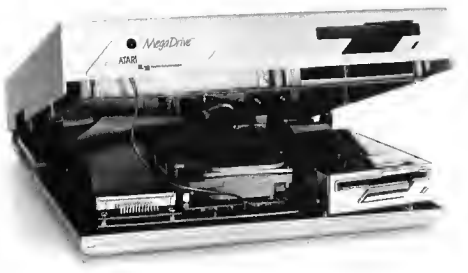
Astra

Astra now produces two lines of hard drives. The original HD+ and the newer Expander both are available in 20, 30 and 40-megabyte (Mb) sizes. Astra's original HD+ has a 31-inch cable and a built-in 3½-inch floppy drive and measures 6-by-4-by-12½ inches. The long cable gives you a lot of leeway when placing the drive and the power light, busy light (for both hard and floppy drives) and on/off switch are on the front of the case. The 3½-inch floppy drive must be used as the B drive, since there is no "drive out" port on the HD+.

Software included with Astra drives consists of programs for formatting (which are notably faster than others I've used), booting and backing up the hard disk. There's no autoboot program, as Astra feels that they have documented ▸

enough problems with such programs for the time savings not to be worthwhile. The backup program uses a special format to squeeze more data on each floppy disk, but it's slow—especially if the disk is not formatted ahead of time. Astra has recently begun including Turtle with all their drives.

Astra's other hard drive, the Expander, measures 3½-by-13-by-13 inches and also has a 31-inch cable. This long, low power to the fourth outlet for your computer. To activate your system, turn on the first switch, wait for the hard drive to come up to speed, then turn on the other switch. One limitation of the Expander is that only single devices can be plugged into each outlet. Attempting to plug another power strip into one of the four outlets can overload the system electrically, leading to some strange events, such as the drive light failing to go out.



Supra drives range from 20 megabytes (Mb) to 60Mb, including a 40Mb internal drive for the Mega.

drive fits well under a Mega or a monitor. And as a side-benefit, the Astra case has room for three devices and the supplied controller can handle three hard drives. Thus, a 40Mb Expander could be expanded to 120Mb by adding two additional 40Mb drives ($600 each), which would cost far less than buying two additional, *complete* 40Mb drives.

Another possibility would be to have two hard drives and a 3½-inch floppy ($100). Installing additional hard drives is fairly simple, as Astra sells them as kits, complete with cables.

The Expander can also double as a system power strip; the back of the unit has four surge-protected power plugs and the front has two power switches, one for the drives and three of the four outlets on the back; the other switch providing

Atari

Atari's two 20Mb hard drives differ only in price and shape of the case. The SH204 is 7-by-3-by-14 inches and has a standard 19-inch drive cable. The Mega File 20, on the other hand, is 13-by-4-by-13 inches and fits perfectly under a Mega ST or as a monitor stand.

Both Atari drives come with formatting and boot programs, a utility to configure the drive for autobooting and a disk cache program. This last program sets aside a portion of memory as temporary storage for information retrieved from the hard drive; then the computer can go to the cache instead of to the hard disk the next time it needs that information—this is much faster. Atari does not include a backup program with their drives.

ICD

The FA-ST hard drives from ICD range from 20 to 50Mb. The case measures 3-by-11-by-11 inches and comes with a 31-inch cable. Not only is this exactly the right size to fit under a monitor, but the case is large enough to contain two drives, which you can add later or purchase with the original drive unit.

The software includes format, boot, autoboot and utility programs. The programs and manual are set up for purchasers of ICD's hard drive kits and include more information than the average user needs—and it's confusing, since it's not clear which controller, etc., should be used when formatting the ICD drives. Fortunately, the defaults seem to work pretty well, but a quick reference guide would be helpful. ICD reports, however, that they are writing a new manual for their FA-ST Drives.

Supra

Supra drives range from 20Mb to 60Mb, and include a 40Mb internal drive for the Mega. All but the internal drive are mounted in a heavy metal box, approximately 6-by-4-by-13 inches. The power and busy lights are on the front, but the on/off switch is, rather inaccessibly, on the back. The cable connecting the drive to the ST is 19 inches long, which is long enough for most locations but still limits where the drive can be placed.

Software packaged with the Supra drives includes the boot program, a formatting program and a utility that can map bad sectors (although unfortunately, this utility sometimes labels perfectly good sectors as bad). The utility can also set up the hard drive to autoboot when you turn on the ST, which is handy and a great time-saver; some programs, however, have problems with any autoboot drives. The Supra software does let you switch from Autoboot to non-Autoboot whenever you wish. And despite my concerns about the utilities, some hard drive experts, such as David Small, swear by them.

A backup program does not come with the drive, but is only available separately from Supra—which is a shame, because it's very important to back up your hard drive. Fortunately, you can find two very good backup programs for next to nothing: Meg-A-Minute Elite (written by the self-same David Small and appearing in the November 1988 issue of START) and Turtle, copyrighted freeware by George Woodside, available on CompuServe. Both do a superb job of saving your data to floppy—just in case.

Supra also makes two unusual drives. The first is their Mega drive. While physically small, it holds 40Mb of data and mounts inside your Mega. Supra includes all their standard hard drive software with the Mega drive. You must install the drive yourself, but at least the instructions are clear. (If you're at all nervous about working inside your computer, though, have a qualified technician do the work.)

The Mega drive connects to two plugs inside the Mega, but if you have an Atari SLM804 laser printer, you *cannot* use the computer's internal DMA port for the Mega drive. Supra is working on a fix for this odd Atari problem, but until a permanent solution is reached, Supra has a cable that allows you to connect your *internal* drive to the *external* hard drive port on the SLMC804 laser printer interface.

Also, to see the Mega drive's busy light, you must drill a hole in the front panel of the computer, but this is relatively minor.

The other unusual Supra drive is the FD-10 "super floppy," which isn't really a hard drive at all, but a remarkable device that stores *10Mb* (that's not a misprint) on a special 5¼-inch floppy disk. The FD-10 isn't as fast as a hard drive, but with its ability to use multiple floppies, it can store unlimited amounts of data and can be used as a regular drive as well as to back up standard hard drives. Normally, GEM doesn't let you switch disks in any drives except A and B, but a special version of Supra's boot software tricks GEM into allowing the FD-10 to switch floppies. This doesn't always work, however, and it can be quite difficult to make the ST re-log the new disk. Fortunately, you shouldn't have to do this very often. Supra includes all their standard hard drive software with the FD-10 and a supplement to the hard drive manual.

Atari's two 20-meg hard drives differ only in price and shape of the case. The SH204 is a "shoebox," while the Mega File 20 is designed to fit under a Mega ST or to serve as a monitor stand.

ICD's FA-ST hard drives range from 20 to 50Mb and its case fits perfectly under your monitor. It's also large enough to contain two drives, so that you can add a second drive later or purchase it with the original drive unit.

Void Productions

The new kid on the block is the Brainstorm, a huge box reminiscent of the system unit for an IBM PC, but slimmer. Hard drives range from 30 to 60Mb and can be ordered with a 3½-inch or 5¼-inch floppy, modem, monitor switch and drive switch. The review unit included a 60Mb hard drive, 5¼-inch floppy, a plug to connect a 3½-inch floppy and a switch to switch between the drives. This could be very handy for using pc-ditto, where you may need to switch between disk formats.

▶

Manufacturer	Model	Drive Sizes Available (Mb)						Dimensions (In.)		Software Included				Other Features
		20	30	40	50	60	80+	Cable	W×L×H	Auto Boot	Backup	Format	Disk Cache	
Astra	HD+	●	●	●				31	6×13×4	●	●	●		1
	Expander	●	●	●	●	●	●	31	13×13×4	●	●	●		1,2
Atari	SH204	●						19	7×14×3	●		●	●	
	MegaFile 20	●						19	13×13×4	●		●	●	
ICD	FA-ST	●	●	●	●	●	●	31	11×11×3	●		●		
Supra	SupraDrive	●	●	●		●	●	19	6×13×4	●		●		3
Void Productions	Brainstorm		●	●		●		19	20×15×4	●		●		1,2,4,5,6,7

Key to Features:

1—3½-inch floppy drive
2—Surge-protected plugs and switches
3—Also available: Mega internal drive and 10 Mb floppy
4—5¼-inch floppy drive
5—1200- or 2400-baud modem
6—Monitor Switch
7—Drive Switch

Like the Expander, the Brainstorm has four surge-protected outlets on the back. On the front is a master power switch and four individual switches, one for each device plugged into the back. The sturdiness of the big unit—it's 3½-by-15-by-20 inches with a 19-inch cable—is impressive. It has legs so you can elevate it over the computer and it's sturdy enough to be used as a monitor stand, although it's not wide enough to support two monitors. Software includes formatting and boot programs and a program to slow down the ST's head-stepping rate for a 5¼-inch drive. Void supplies neither backup software nor an autoboot program, but a real-time clock is built into the box and a program to set it is included.

Other Options

Several kits are available for do-it-yourselfers. Besides the ICD model, Berkeley Microsystems and Beckemeyer Development sell adapters so that your ST can use inexpensive, standard PC hard drives. You shouldn't fool with these unless you're skilled with such things (I'm *not*), because a considerable investment in hardware can be ruined by a mistake. ■

Dave Plotkin is a chemical engineer with Chevron U.S.A. and the author of START's "Mac and PC on the ST" column.

Products Mentioned

Supra hard drives: 20Mb, $699.95; 30Mb, $795; 45Mb, $995; 60Mb, $1,295; Mega internal 40Mb, $995. Supra Corp., 1133 Commercial Way, Albany, OR 97321, (503) 967-9075.
CIRCLE 170 ON READER SERVICE CARD

Atari SH204, $699.95; Mega File 20, $899.95. Atari Corp., 1196 Borregas Avenue, Sunnyvale, CA 94086, (408) 745-2000.
CIRCLE 171 ON READER SERVICE CARD

Astra HD: 20Mb, $895; 30Mb, $995; 40Mb, $1,095; 20Mb, $1,099; 30Mb, $1,199; 40Mb, $1,299. Astra Systems, 2500 S. Fairview, Unit L, Santa Ana, CA 92704, (714) 549-2141.
CIRCLE 172 ON READER SERVICE CARD

ICD FA-ST hard drives: 20Mb, $699.95; 30Mb, $949.95; 50Mb, 1,099.95; dual 20Mb, $1,149.95; dual 30Mb, $1,349.95; dual 50Mb, $1,699.95. ICD, 1220 Rock Street, Rockford IL 61101, (815) 968-2228.
CIRCLE 174 ON READER SERVICE CARD

Brainstorm Hard Drives: 20Mb plus 5¼-inch or 3½-inch floppy drive, $745; 30MB plus 5¼-inch or 3½-inch floppy drive, $845; 40Mb plus 5¼-inch or 3½-inch floppy drive, $995; 60Mb plus 5¼-inch or 3½-inch floppy drive, $1145. Void Productions, 911 E. Pike, Suite 325, Seattle, WA 98122, (206) 324-6809.
CIRCLE 173 ON READER SERVICE CARD

Small Tools

Hard Disk Lore and First Aid Part I

by David Small

We've all been there. Last night your hard disk was working fine. There were "4,567,000 bytes used in 210 items", not to mention the fifty folders on it—a full 10 megabytes of data!

Today, you turned your ST on, the hard disk hiccupped briefly and then you saw: "0 bytes in 0 items". Your data was completely gone.

Welcome to the club.

This Seagate 225 is a very typical hard disk. The ST's operating system and hardware must translate your request to open a file into electrical signals that properly position the read/write heads on the platters.

Screaming Into the Night

Hard disks *are* fast and store a great deal of data, but if you make a mistake (or the ST makes a mistake) on a single floppy, then you've lost perhaps 720K of data (double-sided disk, that is). If you lose a hard disk, however, you may have lost 25 times more data.

Dan Moore and I grew so experienced at troubleshooting hard disk problems during our days at Data Pacific that they became relatively routine. Of course, we learned in the hardest possible way. Thousands of lines of code and days of work were eaten during various hard disk crashes. Hard disks would fail in amazingly creative ways, thus disproving the idea that machines are not (maliciously) intelligent.

Over time, we accumulated a number of tools and techniques for reviving hard disks and preventing the worst of possible damage: complete loss of data. We've published a number of these techniques in START: for example, the hard disk Reviver program (in the Spring 1987 issue), and the Meg-a-Minute Elite Hard Disk Backup program last issue.

It gradually dawned on me that START's readers might appreciate learning the *easy* way what Dan and I had to learn the *hard* way. That's what this column is about. In later installments, we'll present some of the tools and fixes we developed. Of course, don't expect to learn everything from this one article. If you want to "get your hands dirty" and tear into your hard disk—hardware, software or both—you're going to have to do more specialized digging. Right now, let's review some disk basics.

Disk Basics

Most people don't really understand how the ST's disk drive system works. That's because Atari has tried very hard ▶

to shield you from what really happens on a disk when you're using it. They tried for an "intuitive" user interface that would seem logical and easy for *people* to use, but that doesn't mean it's intuitive or logical to the ST! So let's look quickly at an average disk system.

A 360K (single-sided) floppy disk has 720 "sectors" on it. Each sector has exactly 512 bytes in it (½ K). There are 80 circular "tracks" on the floppy, each track pie-sliced into nine 512-byte "sectors." Nine sectors per track times 80 tracks equals 720 total sectors.

A double-sided floppy disk has 1440 sectors on it; each side has the same layout as a single-sided drive. Thus, two sides times 720 sectors equals 1440 total sectors.

To read or write a sector, the "head" is moved, or "stepped," in or out to one of those 80 tracks. Then the disk spins and the head waits for the correct sector to spin by underneath it; it is at that point that the data transfer actually takes place. It takes about .016 second to read or write one sector on a floppy disk.

Nice, Round Chunks of Data

Everything that happens to your disk drive happens in nice, round 512-byte chunks, or sectors. When you read a sector, you always read 512 bytes; when you write a sector, you always write 512 bytes. If you don't need all 512 bytes, the remaining bytes are just wasted.

Now, most of the disk area is purely for file storage. A little of it is devoted to the Directory, which tells the ST where files are located on the disk and the File Allocation Table (FAT), which tells the ST which sectors on the disk are used.

Atari's Graphics Environment Manager—Disk Operating System (GEMDOS) handles all the disk drives attached to your ST. The GEMDOS takes all of your disk "file operations" requests—making a new file, saving it, renaming it, deleting it, moving it—and translates them into 512-byte sector read/write requests to send to your disk drive. Your disk drive knows nothing about "files"; all it knows how to do is read or write a given 512-byte sector (and how to format a disk).

For illustration's sake, let's say sectors #2-10 are the directory, #11-20 are the FAT and sectors for storing files begin at #21. (This is just for illustration; don't use this in real life!)

Everything that happens to your disk drive happens in nice, round 512-byte chunks.

Let's say that your program TEST.PRG is 100K long, so that it uses up 200 sectors of storage. To find and start up TEST, the ST looks through the "directory" (sectors 2-10), finds where TEST is stored (for example, sectors 550-749) and reads sectors 550-749 into memory. Then the ST will begin to execute the code it read in. This is what *really* happens at the lowest level.

What I want to stress is the idea that even with odd-length files you request, even with all the folders and windows and icons, there are still only three things that are *ever* done by a disk drive:

- Read sectors, all of which are 512 bytes long;
- Write sectors, all of which are 512 bytes long; and
- (less common) Format a disk.

If you want more details than this about floppy drives (and formatting), please see "Probing the Floppy Disk Controller" in Issue #2 of START. (Editor's note: *This issue is sold out, but if you send a self-addressed stamped envelope and $1 to Floppy Disk, START Reprints, 544 Second Street, San Francisco, CA 94107, we'll send you a photocopy of that article.*)

Hard Disk Basics

A hard disk is also composed of 512-byte sectors, but many more than a floppy disk. A 10-megabyte (Mb) hard disk has 20,000 sectors, a 20-Mb hard disk has 40,000 sectors and so on. Again, a small portion of the hard disk is reserved for the FAT and Directory and the rest is available for storage.

Hard disks have a few things going for them over floppies. The first is that they spin at 3600 RPM, instead of a floppy's 300 RPM. This means the single biggest cause of a floppy's slow speed, "rotational delay," is reduced more than 10 times on a hard disk. On a hard disk, it takes only .0013 second to read in a sector, 12 times faster than on a floppy.

There are more subtle considerations as well. A typical 20-Mb unit has 615 tracks with 17 sectors per track—but there are also two "platters" within that hard disk with one head on each surface (top and bottom). Yes, there are four read/write heads! Because of this design, the hard disk can access 68 sectors of data without even having to move the heads.

On computers other than the ST, the hard disk can feed data into the computer so fast the computer gets confused. Therefore, the sectors must be numbered strangely, or "interleaved," to *slow down* the data transfer rate! This is very common on the IBM PC, where a 4:1 slowdown is often needed.

The ST is a different breed, however. It has a dedicated "DMA", or "Direct Memory Access" chip. The DMA chip is designed to briefly take over memory from the CPU chip. This is significant because it enables the full power of the ST to be dedicated briefly to the hard

disk and means that the hard disk can be run at 1:1 interleave. Remember, all we are doing is transferring 512-byte sector chunks to or from memory; if we can have uninterrupted access to the memory (which the DMA chip gives us), we can use the disk drive at its fastest rate.

No one has ever accused the ST of being a performance slouch; the DMA chip is one reason.

Average Access Times

Let me introduce you to another buzzword and give you some feel for what it means. It's called "average access time." Once you can run a hard disk at 1:1 interleave, the determining factor of how fast a hard disk is becomes how quickly it can move its head from track to track. There's an industry standard called "average access time," which tells you how long it takes to get from one track to another on the average (not from one track to the next track, just some track to some other track). This time is expressed in milliseconds.

To give you some common timings, the slowest I've seen is 105 msec access time on a Microscience 20-Mb drive. Atari often uses a Seagate ST-225 mechanism, possibly the most popular 20Mb drive unit in the world, with a 65 millisecond average access time. This is medium speed. Faster mechanisms (sometimes called "AT Class" disk drives) are in the 20-30 millisecond range. The very hot 80386 or 68030 machines are using hard disks with under 10 millisecond access times; this is very, very fast and the drives are very, very expensive.

So, we have 40,000 sectors (20 megabytes) on our hard disk. What do we do with it all? Let's leave that for our next installment. . . ■

David Small is the creator of the Magic Sac Macintosh emulator, and has just released Spectre 128, a Mac Plus and Mac SE emulator for the ST.

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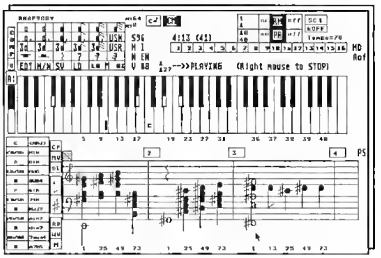

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THIS MONTH ON YOUR START DISK

This issue's START disk is filled with fun and surprises. For fun, try **Wombats II**, Alex Leavens' hilarious, offbeat text adventure game. You may not see any wombats, but the magical creatures you do meet will entertain you for hours. File WOMBATS2.ARC; medium or high resolution

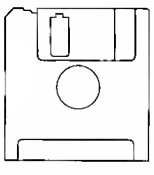
Now kids can dial up Santa Claus and leave him their Christmas wish lists electronically! Dial up Al Baggetta's **Santa BBS** for games and stories. File SANTABBS.ARC; low resolution

Watch Delmar Searls' **See Sorts** in action to see how each of five sorts works. Its graphic, three-color display lets you see exactly what the program is doing each step of the way. File SEESORTS.ARC; low or medium resolution.

Discovery Construction Set, by START Programs Editor Heidi Brumbaugh, lets you create challenging puzzles and quizzes for Discovery. The Construction Set, an updated version of Discovery and some sample files are in the file DCONSET.ARC; requires low resolution.

This issue's programming in BASIC column is a double-header: two great utilities to make programming in GFA BASIC a snap. Contributing Editor Dave Plotkin brings you **Menu Builder**, which makes setting up menu bars as easy as pointing and clicking. The **Generalized Input Routines**, by Michael Hepner, let you set up multiple fields on a single screen. Files MENUBILD.ARC and GENINPUT.ARC; medium or high resolution.

Finally, you'll find a users group registration form for Atari's new User Group News newsletter in the file USERGRP.ARC. (For details, see the section on Atari User Group Support in this issue's News, Notes and Quotes column.)



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Disk Instructions

How to Get Our Programs Up and Running

Each article in this issue with a disk icon on its first page (or next to its title on the Table of Contents) has a companion file on your START disk. These files are *archive* files—they've been *compressed* with the Archive Utilities Set, or ARC, a public domain program available for many personal computers. We use the ARC utility to squeeze the many files that may go with a particular article into *one* compressed file, which may be only 40% of the total size of the original files.

In addition to the archive files, you'll find the program ARCX.TTP, which stands for ARChive eXtract, on your START disk. You'll use this program to *decompress*, or extract, the disk files we've shrunk down with ARC.

Getting Started

To use the files and programs on your START disk, please follow these simple instructions. You'll need two blank, formatted single- or double-sided disks to properly extract the files.

Your START disk is not copy-protected and you should make a copy of it *immediately* to the first blank disk. Make sure the write-protect window is *open* on the START disk at all times to insure that you don't accidentally erase the disk.

Note: If you are unsure how to format a disk, copy a disk or copy individual files, please refer to your original Atari ST or Mega manual and study these procedures carefully before going on.

After you've copied your original START disk, store it in a safe place and label the copy disk "START Backup."

Now, put your START Backup disk in Drive A of your computer and double-click on the Drive A icon to see the disk's contents.

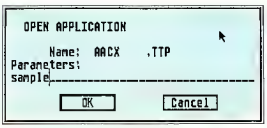
Un-ARCing the Files

To use START's compressed disk files, please follow these steps:

1. Copy the ARCed file you wish to use and the program ARCX.TTP from your START Backup disk onto your second blank formatted disk. When you're finished, label it *Un-ARC disk.*

2. Now you'll extract the compressed files from the ARC file you just copied. Insert your Un-ARC disk into Drive A and press the Escape key on your ST to see the disk directory. Double-click on ARCX.TTP. The following dialog box will appear:

3. Type in the name of the ARC file you just copied over to your Un-ARC disk as shown in the example below and press Return. You do *not* have to type in the extender .ARC.



(Note: If ARCX.TTP can't find a file, it may be because you have misspelled the name of the ARC file. You must type the filename *exactly* as it appears in the directory.)

4. As the program runs, it will display the names of the individual files as it extracts them, similar to the example below.

When ARC has successfully extracted all the files, it will return to the Desktop and you will see the original files within the directory window, along with the archive file and the ARCX.TTP program. You may now use any of the START files as you wish; just follow the instructions in the appropriate article in this issue.

To use any other archive files on your START disk, simply repeat the above procedures.

In addition to the runnable programs, some ARC files may also contain source code listings or an ASCII text file (called BREAKDWN.TXT, for example) which describes the program's structure. You can examine this file from the ST Desktop by double-clicking on its icon and then clicking on Show (to see it on the monitor) or Print (to print it out) as shown in the example below.

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362 Amazing digitized song! (MEG/DBL).
P01 Valuable hints, tips, and programs for PC Ditto (ST format disk).
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At Last! ST Composite Video!

by Andrew Reese
START Editor

This *was* going to be the column in which I explained camera cuts in Cyber Control, but a new product arrived in the START offices that threw that plan in a cocked hat: VideoKey from Practical Solutions. For the first time, *all* ST and Mega owners can have high-quality composite video output for recording animations -- or just playing Starglider II on that 31" TV in the corner.

Practical Solutions has a history of producing excellent, thoughtful products for ST users, products we usually didn't know we needed until Practical Solutions provided them. Monitor Master was their first product and was a godsend to those of us with both color and monochrome monitors. Then came Mouse Master for game players and Drive Master for pc-ditto users. All answered a need, made computer life more convenient and saved plugging and unplugging peripherals. VideoKey, however, is not just a product that makes life more convenient. It is a product we've needed since the first 520 ST was shipped three years ago.

VideoKey is the latest solution from the folks at Practical Solutions. It's invisible to your ST and provides a high-quality composite video output—just the thing for animators.

I Want My Composite Video!

If you've created any animations on your 520 STFM, 1040 ST or Mega, you've probably complained about Atari's lack of foresight in not building composite video output into their computers. There's been only one solution until now: find someone with an older 520 ST with built-in modulated RF output and enough memory to hold your animation. The only problem was that the 520 ST's modulated RF output was less than high quality. It was designed before there was *any* animation software for the ST and it was built to a price; its original purpose was to allow 520 ST's to be used with televisions instead of monitors. But it was better than nothing.

VideoKey is the solution for *all* ST and Mega owners, *including* 520 ST owners. It's a small, Atari-gray box, four ▶

inches by five-and-one-quarter inches by one-and-one-half inches in height with five jacks, one cable, an LED indicator, a slide-switch, a screwdriver adjustment and an external power supply. With VideoKey, you can have your cake and eat it, too—your ST's RGB or monochrome monitor is still available for use with no switching or unplugging. VideoKey is invisible to your system.

Setting up VideoKey is easy. With all the power to your system off, you unplug the monitor cable (or monitor switch cable if you have one) from your computer and plug it into the VideoKey monitor jack. Next you plug the VideoKey's monitor cable into your computer, plug the power cable from VideoKey's external power supply into it and then plug the power supply into an AC outlet. Finally, you connect VideoKey's audio and video signals to your VCR. Use a standard video cable between VideoKey's composite video jack and your VCR's Video In jack and a standard audio cable between VideoKey's Audio jack and your VCR's Audio In jack. You're all connected!

There are only two adjustments on VideoKey: color signal synchronization and channel selection for the TV output. Color signal synchronization is done with a small screwdriver adjustment—called Colorloc—on the bottom of the VideoKey. With a color monitor plugged (or switched) into VideoKey, you adjust this control until the LED indicator glows the brightest. When this occurs, VideoKey is synchronized to your system. It's a one-time adjustment and it seemed to work properly on mine.

The channel selection slide switch switches the TV output between channels two and three; if your television or VCR accepts composite video, you won't need this output at all. In addition, the extra circuitry necessary to translate a video signal into a TV channel degrades the quality noticeably.

There's no power switch on the VideoKey. It's constantly supplied with power from its own external power supply, but it doesn't switch itself on unless there's a color monitor plugged (or switched) into it and in use. Then the LED glows and it's operational—truly well-designed.

VideoKey is the solution for all ST and Mega owners, including 520 ST owners.

VideoKey also provides an audio output, rated at the usual one-volt peak-to-peak at an impedance of 1K ohms. I would have to rate the audio output as no more than acceptable; it seemed a bit muted and muddy to me.

It Works, But You Can Help. . .

But does VideoKey work? In one word, yes! Practical Solutions boasts a signal bandwidth of approximately 4 mHz for VideoKey and the output is far above that from my old 520 ST. It's not perfect, mind you; there's still some bleeding and shimmering on reds and intense blues. Practical Solutions discusses this problem in the VideoKey instruction manual and gives tips on minimizing these effects. Their suggestions are reproduced here in their entirety:

"Some colors are more stable than others. Shades of gray are very stable and greens are very good as well. Use blues and reds with care as they tend to bleed when saturated. Reds are especially notorious in any video work. Try not to put opposite colors side-by-side on the same screen—they tend to bleed into each other. The background color can also make a big difference in how your artwork looks on video."

Another problem that arises when piping ST output to video is the difference between the ST's horizontal synch rate and the industry standard. Although the difference between the ST's 15.769 kHz and the standard 15.734 kHz is only approximately 35 Hz, the result is some artifacting and edge distortion, particularly on sharp, vertical edges. (Artifacting is the name for the false colors that sometimes appear along edges.) Practical Solutions offers—what else?—a (fairly) practical solution. They suggest changing the ST's master clock frequency crystal. By slowing down the ST's clock just slightly (less than .2%), the ST's horizontal synch rate will be almost dead on standard. Nothing else will be affected and your ST still won't run as slowly as a Mac. Contact Practical Solutions if you want to make this change to your ST; it requires some technical expertise.

VideoKey won't work well enough with the 19-inch TV in your living room for you to think of using it for 80-column text display, desktop publishing or any difficult medium-resolution task. It's designed for use in low resolution—for games or animation. And if the game has an intensely blue display, like Typhoon Thompson from Broderbund, the TV display is just a bit too muddy to use. And unfortunately, VideoKey adds one more cable and one more peripheral to the octopus that lurks behind my ST. But if you keep its limitations in mind, VideoKey performs very well and at $119.95, it's a bargain. Thanks, Practical Solutions. ■

Products Mentioned

VideoKey, $119.95. Practical Solutions, 1930 East Grant Road, Tucson, AZ 85179, (602) 884-9612.
CIRCLE 250 ON READER SERVICE CARD

Music Upgrades, Music Fests and Music Online

by Jim Pierson-Perry

Welcome to the ST/MIDI Connection, START's column for news of the ST in the MIDI market. The focus is on industry news affecting the ST, new products or upgrades and topics of general interest.

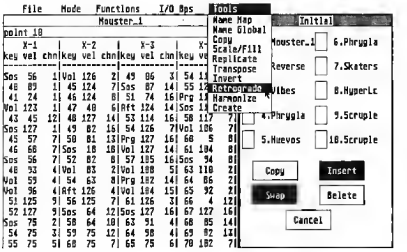
We will cover MIDI applications, rather than programming tricks or teaching MIDI basics. For background information, I strongly recommend the book "Music Through MIDI" by Michael Boom ($19.95, Microsoft Press) which covers MIDI from start to advanced applications in a clear and comprehensive style.

What's New?

Upgrade seems to be the word of the day with five companies having released improved versions of existing programs. These are: EZ-Track Plus and EZ-Score ver. 1.1 (Hybrid Arts), MIDIsoft Studio Advanced Edition (MIDIsoft Corporation), Pro 24 III (Steinberg/Jones), Master Tracks Pro 3.0 (Passport) and Music Studio '88 (Audio Light). More good news for Steinberg/Jones fans: the Pro 24 III manual (Creative Input) is now available. Written by product specialist Geoff Ryle, it is full of information and tips on using the sequencer. (Editor's note: *The back of the latest Tangerine Dream album,* Optical Race, *contains the following line: "This album has been produced on the Atari ST using Steinberg/Jones software." Tangerine Dream is a West German group, and Steinberg Software is a major ST software force in West Germany. The software is distributed in the U.S. by the Russ Jones Marketing Group. An interview with Tangerine Dream appeared in the October issue of START.*)

Dr. T has released several programs designed to work either as standalone applications or integrated with the Keyboard Controlled Sequencer under their Multi-Program Environment shell. These include Fingers and Tunesmith, tools for algorithmic composing and real-time performance, along with updated versions of Caged Artist patch editors (DX Heaven, Matrix 6 Tricks, etc.). (See the Matrix 6 Tricks review in this issue.) They are also distributing Sample Maker (from Virtual Sounds), an extremely versatile sound synthesis and sample editing package.

MIDImouse has added two new programs to their Soniciflight series. These are patch editor/librarians for the Ensoniq ESQ-1/M/SQ-80 and Roland D-10/110 synthesizers. Sound Designer, the top-rated Macintosh sample editor, ▶



Mouseterpiece from MIDImouse uses the mouse to control a three-dimensionol network of notes, patterns and controller effects to create compositions or just ploy in reol-time.

has been ported to the ST by Digidesign.

On the flip side, Hybrid Arts has withdrawn their Oasis Mirage sample editor from the ST market and Steinberg/Jones has acquired the Beam Team software line. No word yet on their plans for release of the long awaited sequencer and scoring modules (Transform X-Note and X-Track) or regarding customer support for current owners of Beam Team programs. (Editor's note: *For reviews of Beam Team's X-Syn series of patch editors, see START Special Issue #2—Music and Graphics.*)

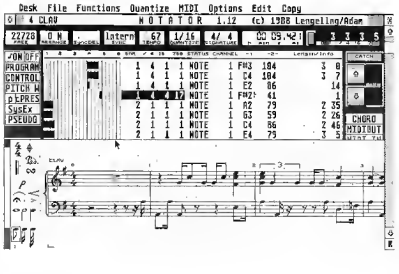
Show Time

Several major music trade shows took place during spring and summer, all featuring many new applications for the ST. The largest was the Musik Messe in Frankfurt, West Germany which highlighted European products. One of the newer ST uses is driving mixer boards; to this end, Jellinghaus Musik Systeme and Syrinx showed dedicated systems. Steinberg demonstrated software to control the Yamaha DMP7 digital mixer along with the Timelock interface (which fits on the ST parallel port) and provides SMPTE compatibility for their sequencing and mixing software. Also on the hardware front, Commander showed an ST-based 16-bit stereo sampler that runs as a desk accessory and can be used at the same time as a sequencer. Akai introduced an upgrade to their popular S900 sampler that lets it interface with ST-compatible hard drives.

Nor was software overlooked: C-Lab showed the Notator program which adds transcription capabilities to their top-ranked Creator sequencer. (A review of both of these is scheduled for an upcoming issue of START.) Digidesign will be distributing these and other C-Lab programs in the U.S. Big Band by Digigram is an algorithmic composing tool designed to work with music files created by Steinberg's Pro 24 III sequencer.

Back in the the U.S., the summer NAMM show (National Association of Music Merchants) was held in Atlanta. Although most of the big guns tend to be saved for the winter NAMM meetings, there were still several new ST applications shown. Hybrid Arts previewed Ludwig and ADAP II. Ludwig is a program for real-time algorithmic composing and musical editing that works with their MIDI Track sequencer line. ADAP II is the second generation of their 16-bit stereo sampler, built around an ST, that now offers direct to disk digital recording.

Two new programs provide alternative ways to create music. Mouseterpiece from MIDImouse uses the mouse to control a three-dimensional network of notes, patterns and controller effects to create compositions or just play in real-time. It comes with an integrated sequencer that can record or play while still creating music with the mouse. In the same vein, MIDI Draw by Intelligent Music also uses the mouse as the playing controller. It transforms a graphic display of mouse movements into musical patterns. A variety of editable effects and tonality changes are provided. Resulting music files can be saved in standard MIDI file format to use with a sequencer or their composing program M. (Editor's note: *For listings of software prices and manufacturers mentioned in this article, see Jim Pierson-Perry's "The Professional MIDI Machine" in the November 1988 issue of START.*)



C-Lab's Notator adds transcription capabilities to their Creator sequencer. Notator provides so many tools that it's like using DEGAS Elite to manipulate your music and graphics!

Hot Numbers

We'll wrap up this month with mention of two good BBS's of special interest to ST users. These are East Coast MIDI at (516) 928-4986 and the MIDI & ST Information Exchange at (614) 848-5947. East Coast boasts a tremendous number of ST-compatible synthesizer patch files and programs. It also hosts a Steinberg/Jones forum featuring messages, files and new product information (headed by product specialist Geoff Ryle). The M&S exchange also has a large number of program files and represents the ST branch of the International Electronic Musicians' User Group (IEMUG), founder of the MIDI-NET message base. ■

Got new info on MIDI and music software and hardware for the ST? Jim Pierson-Perry wants to hear about it. You can write to him in care of START, 544 Second Street, San Francisco, CA 94107, or you can reach him online at PAN (PIERSONPERRY), CompuServe (73637,1300) and GEnie (REMO).

Jim Pierson-Perry is a research chemist and semiprofessional musician. He lives in Elkton, Maryland.

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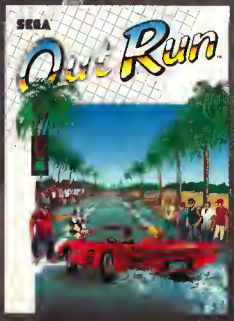

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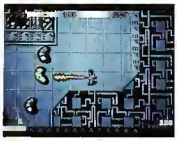

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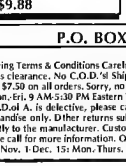

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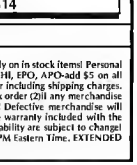

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Matrix 6 Tricks

The Patch Editor For Matrix 6 Synthesizers

by Jim Pierson-Perry

Matrix 6 Tricks is a combination patch editor/librarian for the Oberheim Matrix 6 synthesizer and compatibles. In fact, it is the *only* patch editor for the Matrix 6 available in the ST market.

The program is one of the Caged Artist series of patch editors, distributed by Dr. T's Music Software. These programs are of high quality, easy to use and have a similar user interface. The current version of Matrix 6 Tricks has also been upgraded to run under Dr. T's Multi-Program Environment (MPE), a proprietary multi-tasking shell that lets you run up to four MPE-compatible programs, memory permitting.

The Oberheim Matrix 6 synthesizer. Matrix 6 Tricks is the *only* available ST patch editor for this synth.

Introducing The Matrix 6

The Matrix 6 is an excellent analog synthesizer and an ideal master keyboard for a home MIDI studio. Its versatility stems from the fact that just about every component of the sound generation system can be routed to affect (modulate) any other component(s). It has a staggering wealth of options for devising new timbres; the term used for these multiple routing schemes is matrix modulation.

The internal sound memory layout of the Matrix 6 includes both standard single patches and splits. A split is two patches used in tandem, each with its own keyboard playing zone, MIDI control and transposition. With splits, you can go from two different sounds at once to controlling slave instruments on two different MIDI channels, plus playing the Matrix 6.

Ground Rules

Let's get the bad news out of the way first. Like all other Dr. T's programs, Matrix 6 Tricks does not run under GEM—no desk accessories or GEM multi-tasking shells. The program will not load with any memory resident programs, is heavily copy-protected and cannot be installed on a hard drive.

Matrix 6 Tricks supports all ST computer models, both monitors, a second floppy drive or hard drive for data storage and a printer for hardcopy. This program works with the original Matrix 6 and the two rack-mount versions: Matrix 6-R and Matrix-1000. ▸

The manual is well written and covers all program features. Many trouble-shooting hints are provided plus warnings about some minor bugs in the synthesizer ROM programming and ways to work around them. Unfortunately, the manual is printed in small, difficult-to-read type.

System Set-Up And Controls

Matrix 6 Tricks has three main parts: system setup and operations, librarians for patches/splits and editors for patches/splits. Each major program operation (edit patch, print, system setup, etc.) has its own screen with either drop-down menus or function keys.

In the setup process, both the computer and the synthesizer can be addressed in the system setup screen. On the computer side, you can set the MIDI options, default storage drive, screen colors and mouse options for playing the synthesizer (described below). MIDI Thru with rechannelization is supported so you can either hook the ST directly to your synthesizer or work from a master keyboard. On the Matrix 6 side, you can set all of its Master Edit parameters.

Several input techniques are supported to change parameter values. The easiest is to click on a parameter to change, then move the screen data slider to the desired value. This is particularly useful when setting non-numeric parameters such as modulation sources.

Playing The Mouse

Mouse use is intuitive with this program. Clicking on the right mouse button plays a single note. The left/right mouse position sets the pitch while the up/down mouse position sets the attack velocity (loudness). You can try out new sounds over a wide range of notes from your ST. You can also use the left mouse button to send continuous controller values such as mod wheel, aftertouch or breath control. The desired controller is selected in the system setup screen and may be changed at any time.

Normally, only one note is played at a time. A glissando option can be set in system setup so that the notes glide from one to another while moving the mouse from left to right.

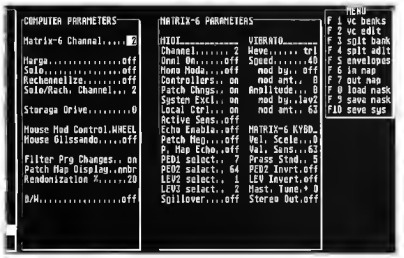
Librarian Features

There are two librarian screens in Matrix 6 Tricks, one for managing patches and the other for splits. A data file holds 100 patches and 50 splits. 24 data files fit on a single-sided disk and 50 on a double-sided.

Two data files can be held in memory at once and you can toggle between them to select, move, swap and copy patches/splits and print out directories of patch and split names within a bank. You can also format disks from within the program.

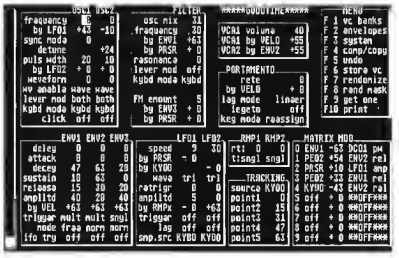
Data files are sent to and received from the synthesizer and ST from the librarian screens. When communicating with the synthesizer, a running index is displayed at the bottom of the screen marking the current patch or split.

The Matrix 6 deals with differences in patch numbering systems among synthesizers with its "patch map." The task is to align the patch numbers between different instruments so that sending a single program change command via MIDI on the Matrix 6 calls the correct patch on a slave unit (or vice versa). The patch map lets you assign patch numbers in both directions for use of the Matrix 6 in either master or slave mode. Both sets of assignments are shown on the patch map screen—a great convenience.



Each major program operation (edit patch, print, system setup, etc.) is done from its own screen. A menu of available operations is displayed in the upper right hand corner of each screen.

Matrix 6 Tricks has an intuitive use of the mouse. Clicking on the right mouse button plays a single note. The pitch is determined by the mouse right/left position while the attack velocity (loudness) is set by the up/down mouse position.



The patch editor is the heart of the program. You can do all editing from a single screen, including auditioning it (via the mouse play feature).

Editing A Patch

In the patch editor, all editing is done on a single screen. Parameter settings are entered or changed using the entry techniques described above. Setting up matrix modulations is a snap as all 20 sources and 32 destinations can be viewed by moving the data slider.

You can "take back" your most recent change with the Undo key. Compare lets you copy any patch from the librarian screen into a buffer; you can then view this reference patch and select parameters from it to copy into another. You can also generate new patches or variations on existing ones through a randomization function. Print produces a hard copy of the current editing patch parameters.

Picture Perfect

For more intuitive patch development, you can move to a separate screen to edit the patch envelopes graphically. Associated patch data such as trigger type, mode and LFO status, along with the matrix modulation setups are also shown and may be edited as well. I only wish the display had been extended to allow graphical editing of the tracking generator.

To edit an envelope, you click on one of its points and drag it to a new position. The corresponding numerical value is shown under the plot. The plot resolution can be varied by changing the time parameter to scale the time axis for all three envelope plots. A vertical line is shown on each plot to mark a theoretical key release point that shows where the release stage would begin if the actual synthesizer key were held down for a specified percentage of the time parameter.

Split Decision

The Matrix 6 internal memory bank stores both individual patches and split setups. Separate screens are provided in Matrix 6 Tricks for split librarian and editing operations, similar to their patch counterparts. The librarian shows the 50 splits currently in memory. All of the patch librarian operations are also supported in the split librarian (e.g., move, copy, load file, etc.).

The split editing screen lets you pick two patches and their associated keyboard zones, transposition and whether MIDI is to be sent and received. The remaining split parameters are the volume balance between the patches and number of voices to be assigned to each zone. The Matrix 6 can play up to six voices at one time; you can assign 0-6 of them to a zone, but the sum of both zones must be 6.

MPE And Beyond

Dr. T's Multi-Programmming Environment (MPE) runs as part of his Keyboard Controlled Sequencer (KCS) program. Under MPE, the mouse play feature of the Matrix 6 Tricks patch editor is extended to start a sequence, cue or range from the KCS event list rather than just playing a single note. The Quit command from the patch editor is also replaced with a To KCS command.

On my 1040 ST system, I've used Matrix 6 Tricks under MPE along with DX Heaven (a DX7 patch editor) and Fingers (a composition/performance program). All worked flawlessly with the sequencer, allowing me to experiment with new patches while composing.

Final Notes

Matrix 6 Tricks makes patch editing for the Matrix 6 patches very enjoyable. Another bonus is Dr. T.'s excellent technical support phone service, provided free to registered customers. I was able to get answers directly on-line, instead of needing a call back. Now if they just had a BBS for off-hours. . .

Unfortunately, the mix of GEM incompatibility and stringent copy protection is a major customer disservice and festering sore point. Virtually every other ST MIDI program from librarian to pro-level sequencer runs under GEM, at least to the point of allowing desk accessories. The present backup policy of a single disk for $15 (more than 10% of purchase price) is also unfair.

To Dr. T's—if copy protection is that important, then at least modify it so we can install the program on a hard drive and/or provide a free backup disk to the customer. It's bad enough to be treated like a criminal without having to pay for the privilege. ■

Jim Pierson-Perry is a research chemist and semiprofessional musician. He lives in Elkton, MD.

Product Mentioned

Matrix 6 Tricks version 2.0, $129. Dr. T's Music Software, 220 Boylston Street, Suite 306, Chestnut Hill, MA 02167, (617) 244-6954

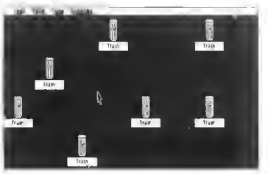
CIRCLE 200 ON READER SERVICE CARD

Clipboard

Tips and Tricks for the ST Owner
Compiled by Heidi Brumbaugh,
START Programs Editor

More on DESKTOP.INF

The Clipboard got a great response to a tip on the DESKTOP.INF file (Special Issue #4); we heard from quite a few readers who have tweaked this file and figured out what nearly every line does. Since this is definitely a hot topic, we'll continue to explore how this file works and how to customize it.



Desktop Practical Jokes: Will the real trash can please stand up?

Both Don Reeder of Eugene, Oregon and Robert Withoff of Bemidji, Minnesota pointed out that the **#M** and **#T** lines in DESKTOP.INF determine the Disk and Trash icons. The first two numbers are the location of the icon on the screen; the third represents the system icons, numbered 00-04:

00—The standard floppy icon.
01—Folder icon.
02—Trash can icon.
03—Program icon.
04—File icon.

Don says he uses the a folder icon to represent a RAMdisk; Robert says the program icon is a good way to represent a cartridge (which must be installed with a lowercase "c").

One final tip: When you're editing your DESKTOP.INF file, turn off your hard disk! Put the experimental files on floppy disks and use them to boot. You can't hurt your computer by trying different values in this file, but you *can* lock up the system at boot time. You're better off booting from a floppy disk, so if your computer locks up you can simply boot from another disk and then go in and correct the problem.

Notes On GFA Optimization

Variables in GFA BASIC can be either strings (**A$**), reals (**A**), integers (**A%**) or booleans (**A!**). Using these variable types efficiently will improve your program's performance—often dramatically. Here are some benchmarks to give you an idea of the improvements to expect, but note: I ran the benchmarks first under the interpreter, then compiled. Separate times are given for each test (the first is interpreted, the second, compiled). The statement **Tmstart=Timer** was directly before each of these segments; after each segment was **Tmstop=Timer** and **Tmdiff=(Tmstop-Tmstart)/200*60**. All times are in jiffies.

```
For I%=1 to 1000 ! 2.4, 0.9
Next I%

For I=1 to 1000 ! 6.6, 3.3
Next I
```

Here's another performance tip: the **Inc** function increases the value of a variable by one—and is much faster than normal addition:

```
Count%=0
For I%=1 to 1000 ! 16.5, 1.5
  Count%=Count%+1
Next I%

Count%=0
For I%=1 to 1000 ! 4.8, 1.2
  Inc Count%
Next I%
```

Here are the same loops using reals instead of integers:

```
For I%=1 to 1000 ! 14.1, 4.8
  Count=Count+1
Next I%

For I%=1 to 1000 ! 8.4, 3
  Inc Count
Next I%
```

If you're interested in how boolean assignments stack up, here are the results of an assignment loop and logical operation loop:

```
Count!=False!
For I%=1 To 1000 ! 6.9, 0.9
  Count!=True!
Next I%

Count!=False!
For I%=1 To 1000 ! 12.9, 1.5
  Count!=Not Count!
Next I%
```

Got an ST trick or tip to share? Send it to Clipboard, START Magazine, 544 Second St., San Francisco, CA 94107. ■

ON DISK!

Generalized Input Routines

by Michael E. Hepner

Get that data! File GENINPUT.ARC on your START disk.

Generalized Input Routines will give your programs flexibility. You can set up an edit screen with multiple fields and a separate menu bar. You can scroll through fields with the arrows, mouse or Return key and can access menu options or Desk Accessories without losing any work.

Here's how to do it.

Up and Running

Copy the file GENINPUT.ARC and ARCX.TTP to a blank, formatted disk and un-ARC GENINPUT.ARC, following the Disk Instructions elsewhere in this issue. You can run the programs LISTING1.PRG and LISTING2.PRG from the Desktop, but you will probably want to look at the ASCII program listings inside the GFA BASIC interpreter. Run GFA and click on Merge, then select the filename.

Listing One (LISTING1.LST) is a simple demonstration; it has just enough code for the program to run. Listing Two (LISTING2.LST) uses the Generalized Input Routines to build an address and phone list file.

Generalized Input Routines let you set up two types of menus: standard GEM menu bars and option list screens. The latter type lists options on the screen and lets the user select them with the mouse or function keys. Data entry

(continues on page 64)

The GFA Menu Builder

by David Platkin

Make building menus as easy as using them with MENUBILD.ARC on your START disk!

GFA BASIC gives you easy access to GEM drop-down menus. These menus make your programs easy to use and give them the "look and feel" of professional programs.

To include a menu in your application, you must build a special string array, for example **Menu_bar$()**, which contains the menu information. Once the proper information has been placed in the string, putting the menu on the screen is simplicity itself:

```
Menu Menu_bar$()
```

Unfortunately, the format of this array is very specific, and if you don't follow it exactly you'll get unexpected results. GFA Menu Builder frees you from the drudgery of setting up menu bars by letting you design your menus right on the screen. Menu Builder then writes the code you need to set up and handle your menu. With your menu bar out of the way, you can concentrate your efforts on the important aspects of programming.

Using GFA Menu Builder

Copy ARCX.TTP and MENUBILD.ARC to a blank, formatted disk and un-ARC the file, following the Disk Instructions elsewhere in this issue. The source code for Menu Builder is in the file MENUBILD.LST; you can print it out by double-

(continues on page 65)

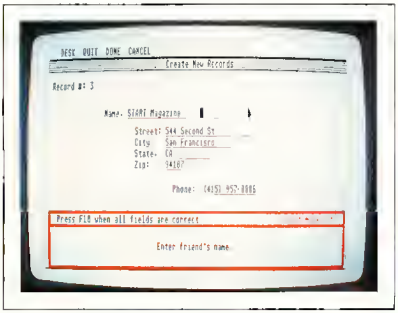
Generalized Input Routines (continued)

screens display any number of data fields and wait for the user to enter data. A typical program would have one or more option list screens with some or all of the options taking the user to corresponding data entry screens.

Each screen is defined by a set of Data statements. Look at Listing One for a description of the different values. You can limit input by specifying a data type for each field; for example, only numbers are valid for a field if the type is set to "NUM." You can create as many data types as you like using the **Instr( )** function.

Changing Menus on the Fly

Each screen may have a different set of customized drop down menus, which are also built from Data statements. You must code an **If** statement in the **Menu_Handler** procedure for each of your menu selections. (Editor's note: *You can use Menu Builder, also on your START disk, to generate these menus. See the article opposite this one to learn how.*) Selecting a menu item will interrupt whatever your program is doing, so take care that variables you are using won't be changed by whatever subroutine is called by menu events.



This sample address book program is on your START disk. You can move around the screen using the arrow keys, Return or Tab, or the mouse.

These routines run in medium or high resolution and they use a combination of **Print At** and **Text** commands because each command has features the other doesn't. If you are using them both in the same program, keep in mind that the command **Print At(X,Y);"ABC"** gives the same results as the command **Text 8*X-8,8*Y-1,"ABC"** in medium resolution.

When you look at the routines that read the mouse position, notice that the program subtracts 22 from the mouse's vertical position because the mouse can point all the way to the top of the screen, but the vertical position for the **Print At** and **Text** commands starts below the window title.

The program has several routines to process keyboard input. The Up and Down arrow keys move the cursor from field to field in the order the fields were defined in the **Fld_setup** procedure. The Insert key toggles the insert mode on and off.

The Help key shows the help message you specify for the current field

The Escape key or the Clear Home key sets the current field to spaces. The Undo key restores the initial value of the current field. The Help key displays the help message for the current field. The Tab, Return and Enter keys signal that the current field is complete. Function key F10 means the entire record (all the fields on the screen) is finished.

You can write your own routines to process the other function keys or Control and Alternate key combinations. Since each key is processed separately, you have the flexibility to make it do whatever you want. In fact, customizing any aspect of Generalized Input Routines is easy; for an example, note how Listing Two performs additional validations on certain fields when you press Tab, Return or Enter.

An Address Book Sampler

The sample program in Listing Two uses the Generalized Input Routines to build an address file. You can create and edit a maximum of 90 records, each containing a name, street address, city, state, ZIP code and telephone number. LISTING2 also lets you list fifteen names, addresses and phone numbers in a column; the routines to do this are modified versions of the Generalized Input Routines.

Run LISTING2. You can move from one field to another at any time by using the arrow keys or the mouse. You can select the Load File and Save File options from the main drop-down menu. Notice that you can leave in the middle of a field to use the GEM desk accessories and come back to finish the field. When the record is done, press the F10 key. If all fields are valid the record is stored.■

Michael E. Hepner supervises a group of computer systems analysts and has worked with computers for the last 18 years.

The GFA Menu Builder (continued)

clicking on it from the Desktop. To load it into GFA BASIC, run GFA and click on Merge. To run the program, double-click on MENUBILD.PRG in medium or high resolution.

The words in the menu line at the top of the screen (initially Desk, Menu1, Menu2, Menu3 and Menu4) are called *titles*, while the items that drop down when you move the mouse up to each title are called *items*. Initially, each set of items under a title are Item1, Item2, etc.

At the top right side of the screen are the buttons that let you set the number of menus. Click on the Up or Down arrows to increase or decrease this number. (GFA BASIC limits you to six menus.)

Below this are the individual menu controls. There is one line for each of the menu titles at the top of the screen. The Menu title boxes show the current titles. To change a menu title, simply click in the box and type the menu name in the dialog box that comes up, pressing Return when you're done. If you type in more than nine letters, the title will be truncated. If you press Return without entering any information the title will not be changed.

You can also swap the positions of menus and their associated items. Point to the title box you want to swap and hold down the left mouse button. When a dotted box appears, drag the box so that the upper left corner of it is over the title box you want to swap with, then release the left mouse button. If the title box is dragged somewhere on the screen which is not over another title box, nothing will happen.

To the right of the menu title box is the DELETE button. Click on this button and the menu title (and all associated items) will be removed. On the right of the Delete button are the controls for the menu items. Click on the Up or Down arrows to increase or decrease the number of items. The maximum number of menu items is 10; the minimum is 1.

To change a menu item, move the mouse pointer up to the title and select the item you want to change just as you would select a menu item. Type in the new name and press Return; the longest the item can be is 15 letters.

You have access to desk accessories when using Menu Builder. However, you cannot change the item names in the Desk menu. To change the first item under the Desk menu (usually "About My Program"), click on the box under "Information under Desk menu:".

Click on Save to save your current settings, then type in a filename using the extension .MBX. This file is readable only by Menu Builder. To load a file, click on the Load button, then type in the filename. The Quit button exits the program. Finally, the Write Code button will write a GFA BASIC listing to disk that sets up your menu and calls a procedure to handle the menu. When you select this option, save the file with the extender .LST.

Using Your Custom Menu in a Program

To load the code into GFA BASIC, run GFA and click on Merge, then select the filename. If you already have a program in memory, the new code will be merged where your cursor is. Menu Builder creates two main subroutines: **Build_menu_bar** and **Menu_handler**. **Build_menu_bar** kills any previous menu in memory, reads your menu titles and items from data statements and stores them in the array **Menu_bar$**. **Menu Menu_bar$()** makes this list the current menu bar.

The procedure **Menu_handler** first puts the name of the item selected in **Menu_option$**; it then sets up a series of **If . . . Endif** statements to handle each of your menu bar items. For example, if one of your menu items is "Quit", the code to handle that item would be:

```
If Menu_option$="Quit"
  'put your code for Quit here
Endif
```

Menu Builder generates a complete program listing.

In effect, this is a shell for you to fill in; between each **If . . . Endif** statement you'll need to type in the action your program should take. Often you will want to replace the comment line with a **Gosub** statement; other times you will only need a few lines of code. This is how you might fill in the above example:

```
If Menu_option$="Quit"
  Alert 1,"Really Quit?",1,"Ok|Cancel",B
  If B =1
    End
  Endif
Endif
```

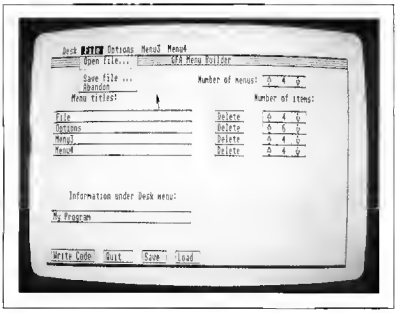
Menu Builder also includes these statements at the top of the code:

```
Gosub Build_menu_bar
On Menu Gosub Menu_Handler
Do
  On Menu
Loop
```

The GFA Menu Builder (continued)

Gosub Build_menu_bar initializes the menu bar; **On Menu Gosub Menu_Handler** tells GFA where to go when one of the drop-down menus is selected. **On Menu** enables event trapping; it is inside an endless loop because the message buffer is continually updated and we want to make sure the **Menu_handler** routine responds to the correct event. If you do not use the command **On Menu, Menu_handler** will never be called.

The program listing that Menu Builder generates is complete and could even run as a standalone program. (However, if you do this, none of the menu items you click on will do anything so you won't even be allowed to Quit out of the program.) START recommends that you use Menu Builder before you do anything else and then use Menu Builder's code as a frame for your own program.



Menu Builder makes setting up a menu as easy as using one; simply click on a drop-down menu item and type in the name for your menu item. Menu Builder will create the program listing you need to set up and respond to the menu.

If you decide later to change the menu options, simply modify the data statements in the **Build_menu_bar** subroutine. The first word in a data statement is the menu title and the last element in a data statement must be a null (""); everything between these two will be menu items. You can change the number of menus or the number of items in a menu without changing anything else in **Build_menu_bar**; the only restriction is that **Data ***** must be the last Data line. You will need to modify **Menu_handler** to include **If . . . Endif** statements for any new items.

Multiple Menus

You may want to change the menu bar while the program is running, for example, to give users a submenu. Generalized Input Routines, this issue's companion GFA BASIC program, does this often.

Run Menu Builder as before, setting up the titles and items of the second menu set. Click on Write Code and then type in a new .LST filename. Quit Menu Builder and run GFA BASIC. Merge in the code you just created. Get rid of everything except the **If . . . Endif** statements and the data statements and then save what's left in ASCII format (GFA's Save,A option). Load your program and then merge in the new code. Use GFA BASIC's Block features to move the **If . . . Then** statements inside the **Menu_handler** procedure and the data statements right after the data statements in the **Build_menu_bar** procedure. Finally, insert a new label directly above the new Data statements, for example, **M_data_2:**.

You will also need to make a few modifications to the code. First, move the statement **Dim Menu_bar$(150)** out of the **Build_menu_bar** procedure to a place in the program that will be executed only once. This could be an initialization subroutine or simply one of the first lines in the program—as long as it's before **Build_menu_bar** is called. Next, get rid of the statement **Restore Main_list_menu_data** in **Build_menu_bar**. Now you can call **Build_menu_bar** as many times as you like. Simply **Restore** whichever dataset you want to set up before you call the procedure:

```
Restore Main_list_menu_data
Gosub Build_menu_bar
```

Notice that the procedure **Menu_handler** takes care of all menu bar activity, no matter which menu you are using. This won't cause you any problems unless two menus contain the same item name. If this is the case, you may want to set up another menu handler procedure, and invoke it with **On Menu Gosub** when you change menus.

Get Organized

The code for Menu Builder is highly structured and very well commented, so it shouldn't be too hard for you to follow. The whole program is driven by the **On Menu** command, jumping to the appropriate Procedure when necessary. This is pretty much the most straightforward way to write an application in GFA BASIC.

The use of branching to self-contained Procedures also makes it easy to follow. Now Menu Builder will make all your programs this elegant! ■

Dave Plotkin is an engineer for Chevron U.S.A., and is the author of START's "Mac and PC on the ST" column.

Products Mentioned

GFA BASIC Ver. 2.0, $79.95. MichTron, 576 Telegraph, Pontiac, MI 48053, (313) 334-5700.

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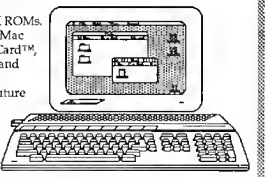

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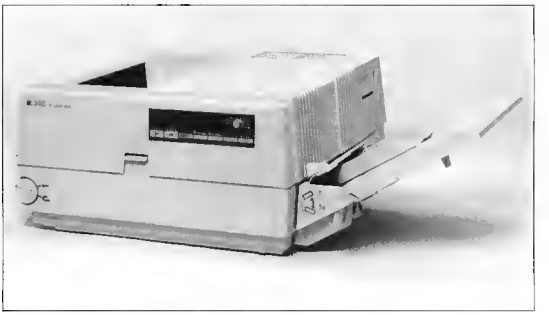
The Ricoh PC Laser 6000

A Workhorse—But Not For The ST

by Frank Hayes

The Ricoh PC Laser 6000 is a workhorse laser printer—a solid, no-nonsense utility printer that's designed for everyday business use. In an office setting where plain-vanilla word processing is still the order of the day, the Ricoh would be a welcome addition. But for desktop publishing or printing high-resolution graphics, the Ricoh may not be the best choice for your ST.



The Ricoh PC Laser 6000 printer.

Text Appeal

The Ricoh's forte is printing ordinary text. It does a good job of emulating the Diablo 630, one of the most popular daisy wheel printers. The Ricoh is fast, reasonably quiet and easy to set up and use. It connects to the ST's printer port with a standard cable; you can also connect it through the serial port. There are four built-in fonts, but you can also download fonts or use Ricoh's own font cartridges. As an office machine, the Ricoh would make a fine replacement for a noisy, relatively slow daisy wheel printer.

Unfortunately, as a desktop publishing machine the Ricoh 6000 has some drawbacks. For instance, its font and graphics commands aren't compatible with either Apple's LaserWriter or Hewlett-Packard's LaserJet, the two standard printers in the world of desktop publishing. The Ricoh is also incompatible with Epson graphics and every other graphics system for both dot matrix and laser printers.

As a result, there are no printer drivers for ST (or non-ST) desktop publishing or graphics software for the Ricoh. An experienced programmer can easily write a simple program in BASIC to print a picture with the Ricoh, but creating your own full-scale printer driver is no easy task

300 DPI The Hard Way

For example, to do screen dumps, I first installed an ST screen snapshot utility, then set up the screen I wanted to print. The snapshot program let me save the picture to disk, but I then had to write a short GFA BASIC program to print the picture on the Ricoh. The pictures came out clear and sharp, but using the snapshot was a roundabout way of doing a screen dump, and much less convenient than with an Epson-compatible dot-matrix or Atari Laser Printer.

You *can* do graphics with the Ricoh ▸

6000. The graphics commands include vector plotting, boxes, ruled lines and transferring blocks of graphic data. And the printing is fine—sharp and clean at up to 300 dots per inch.

But a few other characteristics of the Ricoh were a little annoying. Most dot-matrix and daisy wheel printers can print up to 66 lines on each page; like most laser printers, the Ricoh is limited to 63 standard lines. That means you'll have to adjust your standard page length in word processors such as ST Writer and 1st Word to get the pages to print properly.

The Ricoh also has problems whenever you turn off your ST without turning off the Ricoh as well. The printer works when you turn your ST back on, but an error light flashes until you turn the printer off and then turn it on again.

There's no buzzer to indicate that the printer is out of paper—a regular problem, since the paper tray isn't especially large. When the paper runs out, an indicator light flashes, but it's easy to mistake this for the printer signaling you that it's finished. Of course, a loud, obnoxious buzzer that can't be turned off would have been just as bad as no buzzer at all, but it would be nice if Ricoh provided an optional buzzer.

Manual Dexterity

The Ricoh manual gives reasonably clear step-by-step instructions for setting up, using and maintaining the printer. It also has an extensive chapter on setting up IBM PC software to use the printer in Diablo 630 emulation mode, including individual sections devoted to WordStar, Display Write, Microsoft Word, WordPerfect, MultiMate, Lotus 1-2-3, and dBase II and III.

The manual does have its problems. It doesn't contain most of the technical information you'll need to create your own downloadable fonts. That information is in a separate Programmer's Manual that doesn't come with the printer. Since the Ricoh isn't compatible with other laser printers, the company should at least provide users with the technical information they need.

Is the Ricoh 6000 for you? If you're looking for a laser printer for desktop publishing or lots of graphics on your ST, this probably isn't the one. But if you need a fast, reliable office printer to replace your aging daisy wheels, this may be the machine for you. ■

Frank Hayes is the former Senior Editor of START Magazine, and is now a Technical Editor for Byte Magazine.

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Ricoh PC Laser 6000, $2495. Ricoh Corporation, Peripheral Product Division, 155 Passaic Ave., Fairfield, NJ 07006, (201) 882-2000.

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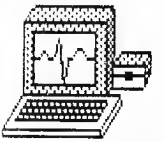

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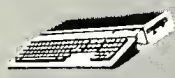

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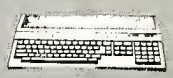

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Discovery Construction Set is an exciting new utility that allows you to expand and modify David Bohlke's Discovery program in START Special Issue Number Four. You remember Discovery—it's the program that challenged you to learn the location of every state in the U.S. by fitting them together like a jigsaw puzzle. It also included a series of trivia questions that tested your knowledge of the country and the states.

But if you think the Discovery program limits you to learning U.S. geography, you're wrong. With Discovery Construction Set you can develop templates that can teach anatomy, the planets or technical components like the parts of a car or computer. Your imagination is the only limit.

Discovery Construction Set actually creates files for the Discovery program. In addition to the construction set and some Discovery files with maps from all over the world, your START disk has an updated version of Discovery. You must use this new version to load this issue's .DSC files.

For kids, the START disk also includes a Discovery file of colorful shapes. Preschoolers can learn to recognize circles, squares and triangles by fitting the shapes into the correct outline positions.

Discovery Construction Set is easy to use. To run the program, copy DCONSET.ARC and ARCX.TTP onto a blank, formatted disk and un-ARC the file, following the Disk Instructions elsewhere in this issue. This file also contains some sample Discovery files, which have the filename extension .DSC.

What's the Object?

Discovery files are made up of individual objects carved from your chosen image. An object is a polygon, graphically defined by the X and Y coordinates of its points. These objects can be anything—states, shapes, countries or the parts of a car engine. There are only two restrictions: the object you choose must be a single color and you must be able to draw it on paper without lifting your pencil. For example, on the USA Discovery file the Hawaiian Islands are connected into a single object with lines.

Each object has certain information linked to it. This information must include the name of the object, a secondary identifier such as its capital and quiz information for between three and 15 categories. If you wish to create a jigsaw puzzle, simply insert dummy category names, then ignore the Discovery program's quiz option.

Finally, Discovery files contain information pertinent to that particular image. This includes the title that will be on Discovery's title screen (e.g. USA Discovery, USSR Discovery) and what the objects, secondary identifiers and quiz categories are.

Get the Picture

The first step in creating a Discovery file is to make an image file and store it in DEGAS Elite .PI1 format. You can use your favorite paint program to draw the picture. If you want to create a geography

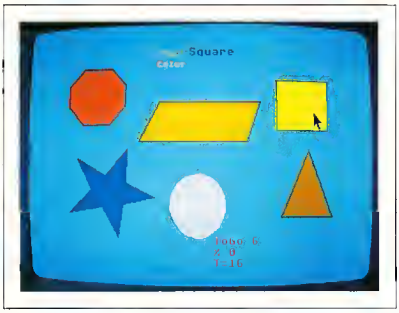
Remember Discovery? It's the program that reminded you that Washington is also a state, that Dover is the capital of Delaware and that Henry Clay came from North Carolina. But now you're ready for some new challenges, right? With Discovery Construction Set and a vivid imagination, you can learn more than just geography.

by Heidi Brumbough, START Programs Editor

file, I recommend using Maps & Legends by Antic Software to create the map.

Datamap Collection I contains overlay files for national political boundaries of world and provincial boundaries of Australia, Canada, China and the USSR (The geographic Discovery files on this issue's disk were created from Maps & Legends picture files.)

If you have technical diagrams or want to use an image from an encyclopedia, find out if your local users group has a scanner that you can use to digitize the image. Once your image is digitized, you can color it in using a paint program.



You can use Discovery Construction Set to make computerized jigsaw puzzles. Use this colorful shapes file to help preschoolers learn to recognize shapes and point with the mouse. The file SHAPES.DSC is in the archive file DCONSET.ARC on your START disk.

Running Discovery Construction Set

When you have your image ready, set your computer to low resolution and double-click on DCONSET.PRG. There are three drop-down menus: Desk, File and Edit. From the File menu you can Load a picture or Discovery (.DSC) file, Save a .DSC file or Quit.

The Edit menu options are Edit DSC file, Edit Title, Clear Picture, Clear Objects and Clear All. Edit DSC is the heart of Discovery Construction Set. Before you can select this option, however, you must load either a .DSC file or a .PIL image so you'll have something to work with. When you click on Edit DSC, you'll see your image and any objects you've defined. The box in the upper right corner of the screen has your editing options Get Object, Delete Object, Edit Trivia and Done.

To define an object from an image file, click on Get Object. Next, click on the points defining the outline of an object. Each point you draw will be marked with an X so that you can see your work. Pretend you're outlining a "connect the dots" puzzle; Discovery will later draw lines from point to point *in the order you defined them*. A box in the lower right-hand corner of the screen will tell you the X and Y coordinates of the points as you click on them.

If you mark a point and then wish to delete it, click the right mouse button. If you click the right mouse button again you'll delete the previous point, and so on. When you've finished defining an object click on the Get Object button again (you must do this before you can select any other options.) Discovery Construction Set will close any open (unfinished) polygon by automatically connecting the last and first points. In your Discovery file, the object will be the color of the point in the center of the polygon on the image.

To delete an object entirely, click on Delete Object and then on the object you wish to delete. Discovery Construction Set will shade the object that will be deleted and an alert box will ask you to confirm your choice.

To see how your polygons look without the image file behind them, go to the main menu, select Clear Picture and then return to the Edit screen. This is what your file will look like in Discovery. You can then reload the image to define more objects without losing those you've just defined.

Discovery files are saved with the last color palette loaded. You can modify your color scheme by first changing the image's palette in a paint program. Then, run Discovery Construction Set and load the .DSC file. Next load the image file with the new palette, and then resave the .DSC file.

Trivial Pursuits

Before you can enter any trivia information in Discovery Construction Set, you must select the Edit Title option under ▶

This Discovery file was created with the help of Maps & Legends from Antic Software, The World Almonac 1988 and Grolier's Encyclopedia on CompuServe. It only took a few hours to make, and would have taken less time if I hadn't gotten sidetracked online and read Grolier's history of Australia. File AUSSIE.DSC.

Rediscovering Discovery

When we started creating Discovery templates for this issue's disk, we realized there had to be some modifications to the original program before it would work with the new files. Therefore, we're putting the updated version of the program (with GFA BASIC source code) on this issue's START disk in the file DISCOVER.ARC. For complete instructions, refer to Special Issue Number 4. The original USA file USA.DSC is only available on that issue's disk.

Here's a brief summary of Discovery's commands in case you don't have that issue:

Jigsaw (outline): Your mouse cursor turns into the shape of the object, and you must put it into the correct position on the screen and press the left mouse button to fill in the outlined objects.

Jigsaw (freehand): Same as above, but this time only an outline of your picture, not of each object, appears on the screen.

Find State/Capital: This draws all the objects on the screen, and shows the State or Capital (or other appropriate identifiers) of each object. You must select the correct object and left-click on it.

Quiz: Same as above, but this time you must select the objects based on trivia information. The program will randomly select three categories of information as clues.

Load: Load a new DSC file. You must load a Discovery file at the beginning of the game, but this option will let you change files while you're playing.

Quit: Exit to the Desktop.

In each case, objects are selected randomly. If you make a mistake, the object will come up again later in the game. Play continues until all the objects have been correctly identified. To exit without finishing, press the right mouse button.

To select an option from the menu screen, left-click on the box to the left of the option to highlight it, then right-click anywhere on the screen. The main menu screen shows your scores and times for the previous five games under each category. ■

the Edit menu. This will ask you for the game title, the name of each object, the second identifier for each object and up to fifteen trivia category names. You must fill the first three items and at least three category names before you can enter trivia for the objects.

Both Edit Title and Edit Trivia use modified versions of Michael Hepner's Generalized Input Routines, which are featured in this issue's "Programming In BASIC" column. Use the arrow keys to scroll up or down the list or press Return or Tab to move down a line. Press the Escape key to erase a line or press the Undo key to restore any changes you've made to a line. Also, you can go directly to a line by clicking on it with the mouse. When you've finished typing all of the information for the entire screen, press the F10 function key.

To enter or edit trivia for an object, click on Edit DSC under the edit menu. Then click on Edit Trivia and on the object you wish to edit. If you haven't entered the title information, an alert box will ask you if you want to Edit Title or Cancel. The Edit Trivia screen will then show you a picture of the object, unless it's larger than half the screen's width.

When you've finished creating your DSC file, click on Done to return to the main menu, then select Save DSC. . . under the File menu. Save the file adding the extension DSC.

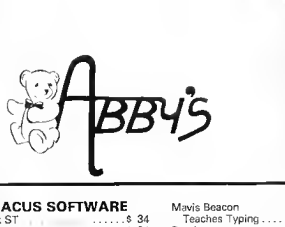
Did you know there are forty-eight countries in Africa, some smaller than the state of Connecticut? This Discovery file (AFRICA.DSC) teaches you the names, locations and capitols of each. Take the quiz and learn Congo's head of state, Tanzania's official languages and the primary religion of Guinea.

A Continuing Discovery

Discovery and Discovery Construction Set were designed as educational tools to make learning fun and exciting. Please send START your Discovery files so that we can share them with other members of the ST community. Also, check Antic Online, our electronic magazine on CompuServe for new Discovery files by typing GO ANTIC. ■

Products Mentioned

Maps & Legends, $34.95; Datamap Collection #1, $24.95. Antic Software, 544 Second St., San Francisco, CA 94107. (800) 234-7001.



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What to Look for in a Modem

by Gregg Pearlman,
START Assistant Editor

As Assistant Editor for START, I'm lucky enough to have a Supra Modem 2400 at my workstation. I've found that working at 2400 baud is much more fun than 1200 baud—to say nothing of 300 baud. ("Baud," put simply, is a measure of how fast information is transferred between two computers.)

A modem is very much like a baseball umpire, an offensive lineman in football or your television set: if you don't notice it, it's doing its job. In judging modems, we at START use a fairly short list of criteria (aside from such trivial items as price).

Hayes is to modems what Epson is to printers—it's the industry standard.

Modem Checklist

If you're running a bulletin board system (BBS), you'll need a modem with auto-answer (ATA) and auto-hangup (ATH) features. You sure don't want to have to do this manually, thus babysitting your BBS.

You want a direct-connect modem—you *don't* want to have to place cups over the ear- and mouthpieces of your phone. Antic Publishing's Tandy Model 100 laptop computer, which we bring to out-of-town trade shows, has a built-in modem that isn't direct-connect and is a royal pain.

Your modem should let you change the baud rate through software. Luckily, most modems do. It's inordinately inconvenient otherwise.

BBS or no, the following features are strongly recommended, if not absolute musts:

Hayes compatibility: Hayes is to modems what Epson is to printers (and, sadly, what IBM is to personal computers): it's the industry standard. Even if your modem is *fairly* Hayes-compatible, it's much better than not at all.

A speaker with volume control. It's best to know what things sound like on the other end. If you hear a busy signal, incessant ringing or a "Hello?" instead of a high-pitched whine known as a connect noise, you know something's wrong. A modem without a speaker is—not merely "is like"—a telephone without an earpiece.

Status lights on the front to let you know what's going on. You'll never know whether you've *really* connected unless the CD (Carrier Detect) light is lit. Others include the baud rate indica- ▶

tor and receive data and send data lights.

A stackable cabinet: Modems must sit wherever you can fit them. It's convenient not only to stack modems on top of other things, but also to stack other things on top of the modem—well, little things, anyway, because the modem probably will be your smallest piece of computer equipment.

Wires leading to and from one place, preferably the back of the modem: It's just easier to store the modem this way.

An RS-232 connector: You want to connect the modem to your ST easily.

Autodial capabilities for pulse and tone dialing: Otherwise, you're extremely limited.

Long, continuous use doesn't slow down the modem or hurt transmission: If you use a modem constantly as part of your work, you don't want to have it "throw up" because it's become too hot or tired.

Complete documentation: The benefits of this should be obvious.

2400 Baud

Happily, the Supra 2400 meets all of these conditions, and it's fun to use. Alas, the volume has but three settings—the quietest is still loud—but things go much faster online at 2400 baud. One thing you didn't see in the above list is the absolute necessity for 2400 baud capability. It *isn't* necessary; it's just nice. If you don't have it, you won't miss it.

The main problem with 2400 baud is a larger possibility of data transmission error than with 1200 baud (and especially 300 baud). If your data line has *any* interference at 2400 baud, there'll be trouble. Also, many commercial online services charge more per hour for 2400 baud users, so if you have several transmission errors and must retransmit, you'll be nickel-and-dimed to death.

In practice, 2400 baud is *not* twice as fast as 1200 baud (or eight times as fast as 300 baud), but it is much faster. Keep in mind that modems are "downwardly compatible": you can use a 2400-baud modem at 300 baud but (obviously) not vice versa.

This is a cross-section of typical modems, not a be-all and end-all compendium.

Finally, there's a question of price. You can find a 1200 baud modem for under $100, or a 300 baud modem for less than some florists charge for a dozen roses. You won't have that kind of luck with a 2400 baud modem—or any Hayes modem. (Antic Online Editor Charles Jackson says, "You're paying for the Hayes name as well as the modem—plus the fact that you can drop it from a 20-story building without hurting it.")

What follows is a brief look at some of the modems we've seen here over the last two years. This is a cross-section of typical modems, not a be-all and end-all compendium.

Atari SX212

The SX212 is Atari's first 300/1200 baud, Hayes-compatible direct-connect modem. In a review in the June 1988 issue of Antic, Charles Jackson said that it works fine—it had no problems with any terminal program we tried and we also created and ran a BBS with it—but since then, it seems to have given up the ghost without explanation. We hope it's an isolated case.

The SX212 met most of the above criteria. A glaring exception is the "long, continuous use" item. Charlie put the SX212 through some pretty heavy paces, though, which indeed may have caused its demise. Also, the documentation that came with the modem was a bit thin. Some minor inconveniences include a nearly inaccessible speaker volume control and dim, hard-to-read status lights. Even so, the SX212 still has a suggested retail price of $99.95, and it's an excellent bargain.

Potriot 2400E

The Patriot 2400E, available from Anchor Automation, uses the standard Hayes AT command set—which is not to say that it's exactly Hayes-compatible, but it's a start. It does have a speaker volume control knob and status lights, as well as DIP-switches that you can (but don't always have to) adjust to make the modem work with your terminal program. The Patriot 2400E is compatible with *any* computer, as long as you have the necessary interface. The comprehensive documentation includes a quick-reference sheet and several self-tests.

Volks VM520

Before the Supra showed up, I used a Volks VM520, a Hayes-compatible 300/1200 baud modem that really did the job.

On a dirty line, the VM520 tended to drop the occasional character at 1200 baud, although there was no problem at 300 baud. The manual told us all we needed to know, however, and the package included a 6-foot modular telephone cable to connect the modem to a telephone or wall jack.

Good luck finding the VM520, though. You can buy it directly from Anchor Automation, but via special order only.

Hayes Smortmodem

The Hayes Smartmodem is Charlie Jackson's standby. So far, he hasn't given it the sidewalk-impact test, but that's

largely because he likes the modem so much. This 300/1200 baud modem certainly meets all the above criteria and probably gets more use here than the rest of the other modems combined—with the help of the Smartmodem, Charlie built not only Antic Online, a Herculean task in itself, but our searchable online index, soon to be available, which already is at least twice as large as Antic Online. This modem is a workhorse, and we've never had any problems with it. For $399, we'd better not.

ST Forum News

Next month, "Online With START" will be written by Ron Luks, Chief Sysop of the Atari Forums on CompuServe, who'll give you the low-down on the drastic realignment of the ST forums.■

Products Mentioned

Supra Modem 2400, $179.95 ($219 including cables and software). Supra Corp., 1133 Commercial Way, Albany, OR 97321, (503) 967-9075 (orders), (503) 967-9081 (technical support).

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Atari SX212, $99.95. Atari Corp., 1196 Borregas Avenue, Sunnyvale, CA 94086, (408) 745-2000.

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Patriot 2400E, $229; **Volks VM520**, $199. Anchor Automation, Inc., 20675 Bahama Street, Chatsworth, CA 91311, (818) 998-6100.

CIRCLE 217 ON READER SERVICE CARD

Hayes Smartmodem 1200, $399 (estimated retail). Hayes Microcomputer Products, P.O. Box 105203, Atlanta, Norcross, GA 30048, (404) 449-8791.

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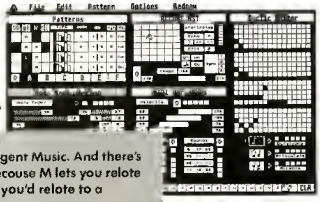

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Doing Battle: Then, Now and When

This issue we look at four new games: an updated version of an ST arcade classic, two World War II plane simulations, and a fantasy adventure.

STARGLIDER II

by Scot Tumlin

Starglider was one of the first truly great games for the Atari ST. It combined strategy with non-stop action and its 3D graphics became a benchmark for all 3D games that followed. In short, Starglider was hot, and Starglider II is even better.

The idea behind the original Starglider was fairly simple: fly around and destroy anything that moved, doing so until your energy ran out. The same principle applies to Starglider II, only this new version is much more complex and involved.

What You Get

Starglider II comes with disk, novella, key guide and play guide. A cassette tape with the Starglider II soundtrack and a color poster are also included. You can boot the disk on either the ST or the Amiga (yes, the same disk works on both machines). The game requires a color monitor.

Starglider II. The idea behind the original Starglider was fairly simple: fly around and destroy anything that moved until your energy ran out. The same principle applies to the more complex Starglider II.

The novella is a short story that fills you in on the Novenia/Egron drama. It also doubles as the game disk's copy protection. When booted, the game will ask for a particular word from the novella. You then have to locate that word and type it in.

The key and play guides contain gameplay information. Although very helpful, both guides are printed in very small, difficult to read type.

The Plot

The Novenian council has asked you to help them combat the evil Egron empire. It seems that the Egrons have taken over the Solice system (the closest star system to Novenia). There the Egrons are constructing a massive space station. Your mission is to destroy this space station, using your Icarus attack craft. If you succeed it will spell doom for the Egrons.

There are five planets in the Solice system: Dante, Vista, Apogee, Millway and Aldos. Each has its own gravity, size and Egron presence. This last factor can determine how much enemy resistance you'll face. The planets Apogee, Millway and Aldos also have moons. Some planets can be used to replenish your energy or ▸

weapons supply, while others can be used to repair damage to your ship.

The Icarus

The Icarus attack ship is your only hope for survival, what you do with it will determine the fate of the Solice system.

The Icarus has five weapons bays. The ship's five weapons include Plasma lasers, Time-warp cubes, Fire-and-Flee missiles, Bouncing bombs and Neutron bombs. Visual and audio analyses let you identify objects by sight and sound, and the Icarus has an onboard computer that gives status information about any identifiable object. A tractor beam can lock onto an object and let you examine it and store it in your cargo bay; multiple engines allow surface travel as well as travel between planets.

The center of your screen displays a first-person view of your surroundings (just like Starglider). The top of the screen displays grid coordinates, mission time and score. The bottom of the screen displays translucent 3D bars that rise and fall as your engine and weapons energy change. The lower right side of the screen displays a hologram of the selected weapon in use. For example, when you select the Neutron bomb, you'll see an animated mushroom cloud. A status bar at the bottom of the screen displays up-to-date information about the progress of the space station.

Your mouse is used to control the Icarus (as in Starglider); the only difference is the ability to roll the ship.

Stardrive

For interplanetary travel the Icarus is equipped with Stardrive. Engaging the Stardrive causes the screen to display a series of lines stretching from the center of the screen (like the hyperdrive effect in *Star Wars*). Movement is very quick, so make sure you don't collide with any objects while the Stardrive is engaged.

As you travel between the planets watch out for space pirates, who like to orbit around certain planets. They take anything they can get their hands on. If you run into them be prepared to duke it out and take any cargo you can find!

Completing Starglider II takes skill, strategy and, most important, patience.

Tunnel Networks

Some of the planets and moons contain network tunnels that run beneath the surface. Tunnel entrances appear as 3D domes on the planet's surface. Once you're inside, the tunnels appear as a series of rotating tubes.

Inside the tunnels are "service depots," which appear as huge service bays. These depots are run by rebels fighting against the Egrons. I mentioned earlier that some of the planets have a special interest to you and your mission. At times your ship will need repair and new weapons. Some of the rebels have the technical knowledge to fix your craft, and others can supply you with the weapons you need.

Remember, the Icarus has five weapons bays. When the game starts some of the bays are empty. To get additional weapons you'll have to deal with the rebels. Any objects you've collected (with the tractor beam) can be used as trade for weapons or repair.

The Egran Space Station

The final challenge in Starglider II is to destroy the Egron Space Station. The space station is being constructed in orbit around the planet Millway. As the game progresses, powerful beam projectors are placed on each of the seven moons of Millway. The beam projectors protect the space station during its construction (reminiscent of *Return Of The Jedi*). You must destroy the space station before it's completed.

Though I won't tell you how to destroy the Egron space station, I will tell you this: the neutron bomb is the only weapon that can do it. Of course, first you'll have to find the bomb, which won't be easy. (Hint: find out who designed it.)

Recommendation

Starglider II is a great game and a logical sequel to the original Starglider. The solid 3D graphics move in real-time and look awesome. The choice of weapons gives you the power to handle any enemy.

Completing the game takes skill, strategy, clever deduction and, most important, patience. The original Starglider set standards few computer games could match. Starglider II sets those standards even higher.

DIVE BOMBER

by Scot Tumlin

The year is 1941. In the frigid waters between Iceland and Greenland the HMS Hood is sunk by the Bismarck and nearly 1,400 crewman are sent to a watery death. The British want revenge. The Avenger, a secret U.S. Navy prototype torpedo plane, is flown to the Ark Royal aircraft carrier. Its mission: to sink the Bismarck!

In Epyx's Dive Bomber it's up to you to destroy the Bismarck in your Grumman Avenger, WWII's deadliest torpedo bomber.

The Game Screens

When you boot Dive Bomber, a menu with two options is displayed. The first option, flight training, lets you practice takeoffs, landings, standard flight and weapons firing. Once you master this you can select the second option and carry out the mission. The practice feature is a nice touch – it lets you familiarize yourself with every aspect of the mission.

The Avenger's controls are divided among four screens. The first is the pilot's screen, where you control the actual flight of the plane. The top half displays a first-person forward view from the cockpit; the bottom half displays your instrumentation.

The second screen is the engineer's section. Your instruments display the status of your engines (oil temperature, RPMs, etc.), landing gear and torpedo bay. An interesting detail: you must turn on a light switch to see the dials. Be sure to turn it off when you leave this screen, however: enemy planes can see the light and your chances of getting shot down are increased!

In Dive Bomber it's up to you to destroy the Bismarck in your Grumman Avenger, the deadliest torpedo bomber developed during World Wor II.

The third screen displays a map of the area. This is where you plot the Avenger's course. Clicking anywhere on the screen will set a red marker on the compass dial in the pilot's screen, and centering the marker will place the Avenger on the proper course.

The last screen displays the tail gunner's area, where you can engage enemy fighters attacking from the rear. The top half of the screen displays a first-person rearward view of the plane. You use the mouse to place a target cursor over enemy aircraft as they approach, while holding down the left mouse button to fire your guns. The bottom half of the screen displays the number of rounds remaining.

Each screen contains a screen selection box, where you can switch to any other screen and monitor what's going on elsewhere. For example, if you're in the pilot's screen and screen four flashes then enemy fighters are approaching from the rear. If you have engine trouble screen two will flash, etc.

Dive Bomber's graphics are very nice. The cockpit instrumentation dials are easy to read and actually aid you in your mission. When you land, an image of the aircraft carrier is displayed; as you move closer to it, the deck fans out, creating a nice 3D effect. During combat, enemy fighters bank and roll as they approach your Avenger. When hit they burst into flames and fall to the ocean. Rounds fired from your Avenger appear as small dots; your direction, speed and other factors influence your aiming accuracy, another nice touch! The only addition I'd make would be to have smoke plumes appear as you fire your guns.

Playing The Game

A realistic feature about Dive Bomber is the amount of activity it takes to keep the plane in the air. There is a proper procedure for every section of the mission. During takeoff you must lock down the wings, raise the arrester hook (needed for landing on the carrier), select the proper fuel tank and set the fuel mixture. When landing, you must lower the gear (including the tail wheel) and arrester, as well as reduce your airspeed to 175 mph and set your altitude between 50 and 100 feet. You *really* have to fly this baby!

Once airborne, you set a course for the Bismarck, although enroute you'll come up against enemy aircraft. Note: watch the screen selector boxes carefully. If screen one or four flashes, access that screen immediately, select your guns and hose down anything in the air.

When the Bismarck is in range, select the torpedo. Drop down to 100 feet, get close to the Bismarck and let the torp fly! Once you fire, a page-flipped animation of the torpedo heading for the Bismarck is displayed. This is the only effect I didn't like, since normally the ocean surface is shown effectively as a series of dots that pitch and roll. Going from this effect to the page-flipped animation takes something away from the game, I think, and I wish the game's authors had written a 3D animation of the torpedo hitting the Bismarck.

Once the torpedo is delivered, return to the Ark Royal for a status report. If you missed the Bismarck then reload another torpedo, refuel and try again!

The Aftermath

Overall, Dive Bomber is a very good game. The manual is clear, explains each screen's functions well and includes a section of hints and tips that will help the beginner. The mission practice feature also makes learning each aspect of the mission easy.

I recommend Dive Bomber to anyone who wants to play an exciting World War II "flight and fight" simulation. Even though the Avenger didn't ▸

really take part in the sinking of the Bismarck, it's fun playing "what if?"

BOMBER COMMAND

by Scot Tumlin

Bomber Command is the latest release from Mars Software. Although much more simplistic than Carrier Command and Dive Bomber, it still presents enjoyable arcade game action.

It's a typical vertically-scrolling game, like Goldrunner and many others. You can play with either a joystick or mouse. Your objective is to shoot anything that moves and bomb whatever doesn't, while avoiding being destroyed yourself.

The Screen

Bomber Command's playing screen is well-drawn and uncluttered. The left edge displays the number of aircraft remaining (you start with five) and your currently active weapon (guns or bombs). The rest of the left side is taken up by a window displaying a birds-eye view of the terrain. The score, bombs available and your current rank appear on the right side of the screen. As you drop bombs, replacements are moved into the loader. The bombs available window displays the number of bombs you have ready; the rank window displays your current military rank. As your score increases you move up in rank.

Your bomber's guns are very effective against enemy aircraft.

Flight Graphics

Your flight controls are simple: pushing your joystick forward will move you to the top of the screen and speed up the scrolling; pulling back will move you to the bottom of the screen and slow down the scrolling.

The surface graphics are nicely rendered. Enemy naval vessels pass over the water's surface and ground targets (bases, landing strips, transports) are highly detailed right down to the parked trucks.

Bomber Command is a typical vertically scrolling game. In it you shoot anything that moves and bomb whatever doesn't, while avoiding being destroyed yourself.

Combat

You face three different enemies in the game: planes, ground targets (stationary and moving) and missiles. When engaging air targets, pressing the joystick button will fire your guns; when over land targets the button will drop bombs. Dodge and weave to avoid the enemy missiles—you can't destroy them.

Your bomber's guns fire continuous bursts that are very effective against enemy aircraft. The enemy planes don't fire back, but be warned: when hit the enemy planes will explode and their debris will advance down the screen. If the pieces hit you they can destroy your bomber.

When approaching a land target, a targeting sight will appear in front of your bomber. Use the sight to aim your bombs, then once over a target press the joystick button. It takes practice to learn how to place your bombs correctly. As with the missiles, avoid flak (appearing as plumes of black smoke) from enemy artillery guns.

Tips And Wrap Up

When playing Bomber Command it's best to position your bomber at the bottom of the screen. This will help you avoid enemy flak and allow you enough time to react to any threats. As enemy planes approach, blow up as many as possible and avoid the fragments of those already destroyed. For every 5000 points you accumulate you are awarded a new bomber and you can have a maximum of five. As your score increases so will your rank. A score of 10,000,000 will get you the ultimate rank: Ace.

Bomber Command's graphics are well done and the gameplay is very enjoyable. There are plenty of targets to shoot at and the game lets you make sufficient progress to hold your interest. The four-page manual explains every section of the game clearly (you don't need much of a manual for an arcade shoot-em-up). A pause feature lets you take a break from shooting and bombing and a load/save game option is also included, helpful to those on their way to becoming an Ace.

Ultima IV isn't just another "slosh and bash" game. In order to succeed, you must talk to *everyone*. Even the most inconspicuous person or deed could yield a vital clue leading to your success.

Bomber Command may be a throwback to the old days of the "mindless shoot-em-ups," but for this arcade game player, that's sometimes *exactly* what I want.

ULTIMA IV: THE QUEST OF THE AVATAR

by George Miller

Origin Systems' Ultima series has been my favorite fantasy-adventure game series for a long time. Each new quest in the series seems more interesting than the last.

Although the quest known as "Ultima III" vanquished the ruthless Triad of Evil from Britannia, evil still exists in the hearts and minds of the people. Your goal is to become an Avatar, a shining example of virtue to all.

Monsters of all types may bar your way, and there are temptations to cause you to stray from the path of the righteous. If that's not enough, dangers abound in this strange and mystic land.

What Characters. . .

Ultima IV isn't just another "slash and bash" game. In order to succeed, you must talk to *everyone*. Even the most inconspicuous person or deed could yield a vital clue leading to your success. You'll need the clues offered by the townspeople. And one of the most pleasant features of "Ultima IV" is interacting with the characters you meet in the towns of Britannia. You'll be able to convince some of them to join you.

Ultima IV comes with two disks and includes "The History of Britannia," a book of magic spells, a player reference card, and a beautiful cloth map of the Kingdom of Britannia. Read the history before you begin to play—it will help you interact with the characters.

You'll be purchasing your goods in the towns; visit the Armory and Weaponry before venturing too far afield! And one additional hint: stay close to a city until you gain experience. You'll need a safe refuge and the powers of the Healers to survive. Many of the creatures you'll meet as you roam the countryside are formidable opponents. One thing you can count on: anything you meet outside of a city is certainly not friendly! Britannia is most definitely a hostile land! (Note: if you become hopelessly lost in your explorations, the hint book "The Way of the Avatar" is available from Origin Systems for $12.95.)

Comparisons And Conclusions

I've played Ultima IV before on another computer, so I knew what to expect from the ST version. However, I was pleased that Origin Systems had taken advantage of the ST's graphics and sound and you could move around by using the mouse. (I did find it easier to move by using the keyboard controls.)

Although the graphics and sound are not on the level of Dungeon Master, Ultima IV met my expectations. Its overall playability is good and it's much faster than previous ST versions of Ultima.

Ultima IV is a game I highly recommend for all who enjoy fantasy-adventure games. You'll be spending many enjoyable hours exploring and developing your characters' skills. ■

Scot Tumlin is Direct Mail Sales and Support Supervisor for Antic Software; George Miller is Director of Product Support for MichTron, Inc.; Dave Plotkin is a chemical engineer for Chevron U.S.A.

Products Mentioned

Starglider II, $44.95. Rainbird Software, 3885 Bohannon Drive, Menlo Park, CA 94025, (415) 322-0900.
CIRCLE 155 ON READER SERVICE CARD

Dive Bomber, $49.95. U.S. Gold, distributed by Epyx, 600 Galveston Drive, P.O. Box 8020, Redwood City, CA 94063, (415) 368-3200.
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Bomber Command, $39.95. Mars Software Development Inc., P.O. Box 70947, Pasadena, CA 91107, (818) 351-6224; (800) 541-0900.
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Ultima IV: Quest of the Avatar, $59.95. Origin Systems, Inc., distributed by Broderbund Software, 17 Paul Drive, San Rafael, CA 94903, (415) 492-3200.
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ON DISK!

A Sorted

See See Sorts sort Shell sorts sets! File SEESORTS.ARC on your START disk.

You have a file that needs to be sorted. You've read about different sorting routines, but you can't remember which one is best for your data.

START's See Sorts program can help. This remarkable program graphically illustrates five common sorting routines: bubble, insertion, selection, Shell and quick. You'll be able to see how they work and compare them on the same sets of data.

See Sorts was written in True BASIC, which is available on a number of different machines. SEESORTS.TRU is the source code in ASCII format and runs on IBM PC compatibles as well as the Atari ST. The program's display features take much more time (and are much longer) than the sorting itself. All of these extra instructions are tabbed over to make it easier for you to read just the sorting algorithms.

Running See Sorts

Copy SEESORTS.ARC and ARCX.TTP to a blank, formatted disk and un-ARC the file, following the Disk Instructions elsewhere in this issue. See Sorts requires a color monitor and runs in low or medium resolution. Double-click on SEESORTS.PRG to run the program, and use the Up and Down arrow keys to move from one menu option to another. To confirm a selection, press the Return key. The Escape key quickly backs out of any sub-menu or aborts a sort in progress.

Pressing the first letter of an option label will immediately select and confirm that option. (You must confirm your decision to Quit by pressing Return.) Pressing 'S' or 's' on the sort sub-menu will select a selection sort; to select a Shell sort press H.

Menu Options

The main menu options are Sort, Data, Length, Options and Quit.

The Sort menu gives you a submenu of the five sorting routines. Select a sort and the program will sort the current data set. The Data menu has four options: Forward, Reverse, Shuffle and Partial. Forward creates a list of integers from 1 to N where N is the length of the list. Reverse creates a reverse order list (N to 1). Shuffle randomly shuffles the current list. Partial partially shuffles the current list.

These various kinds of lists illustrate which sorts work best in which situations. The current list will stay the same until you change it under the Data menu so you can compare different sorts on the same list.

The Length option lets you choose the number of elements in the list: 20, 40, 60, 80 or 100. When you select a new length, the program creates a new randomly ordered list.

The Options menu lets you enable or disable the display options: Graphics, Totals and Step. Graphics enables or disables the graphic display of the sorting routine.

If the Totals option is enabled, the program will show you a running count of the number of comparisons and assignments. The number of comparisons is incremented each time two elements in the list are compared. Similarly, the number of assignments is incremented each time an assignment involving an element of the list is made. For example, a simple swap of two elements in a list involves three assignments.

When you are only sorting a list of

Storing information is one thing; sorting it so it's readily accessible by computer is another. No wonder that developing faster and more efficient sorting algorithms has long had a central role in computer science. Now START brings you a program that doesn't just explain sorts—it graphically illustrates, step by step, exactly how five popular sorts work so you can see which is best for any application.

Affair

by
Delmar E. Searls

integers, a comparison and an assignment take about the same amount of execution time. However, often the comparisons are based on key values that represent only a fraction of the entire record. For example, the key value for an entry in an address book might be the last name field. In such cases, the time required to reassign all the values in the record is substantially greater than the time required to compare keys.

The Step option lets you enable or disable the single-stepping feature. If enabled, the sorting routine will pause after each step until you press the Space bar. You can enable stepping at any time during a sort by pressing the Space bar; pressing any other key will disable it.

Pressing Return on Graphics, Totals, or Step toggles between enable and disable. If the display option is enabled, it's blue; if disabled, it's red. The selected option will be in a yellow box. Select Exit or press the Escape key to return to the main menu.

When you first run the program, the list will contain 40 randomly ordered elements. Graphics and Totals are enabled; Step is disabled.

Bubble Sort

The first sorting routine is the bubble sort. This is a very slow algorithm with no redeeming virtues and is included only because it is so widely known.

To see how a bubble sort works, spread a shuffled deck of cards on a table to represent an unsorted list. Now compare the face value of the first and second card. If the value of the first card is greater than the value of the second, swap them. If the first card was a seven and the second card was six, for example, you'd switch them.

Next, compare the second card to the third card, swapping them if necessary, the third card with the fourth, the fourth with the fifth and so on. Keep on comparing and swapping if necessary until you've done all the cards. Now the card with the largest face value is at the end of the list. Make another pass to find the highest card in the remaining portion of the deck and put it in the next-to-last position. On each pass the sorted portion of the deck grows by one and the unsorted portion shrinks by one.

In See Sort's graphic display, the unsorted portion of the list is shown in red. The sorted portion is blue. As consecutive pairs of elements are compared (and swapped, if necessary) they are drawn in yellow. As you watch the sort, note that the large values sink to the bottom (like rocks) and the smaller values tend to rise to the top (like bubbles in water).

The execution time of a bubble sort is approximately proportional to the length of the list squared. This is often written using "big-oh" notation: $O(N^2)$. This means that a list twice as long as another will require approximately four times as long to sort. The bubble sort is especially poor because it requires both a large number of comparisons and a large number of assignments. It is the slowest sorting technique included in See Sorts and I don't recommend it in any situation.

If the initial list is reversed or nearly reversed, the bubble sort will take an especially long time to sort.

In all fairness, there are ways to improve the performance of a bubble sort. But even when that is done there is nothing to recommend it over the other sorting routines discussed below. ▶

See Sorts graphically illustrates what is going on during sorts. Not only will you better understand how these sorts work, it will be easy to see which routine works best on which types of data sets.

Insertion Sort

Let's use the "deck of cards" example again to illustrate the insertion sort. Reshuffle the deck and spread it out on the table, as before. Pick up the second card and decide whether it belongs before or after the first card, then insert the second card in its proper position. Now pick up the third card, decide whether it belongs before the first, after the second, or in between the two and insert it where it belongs. Next, pick up the forth card and insert it in its proper place among the three. Continue picking up and inserting the cards until you reach the end of the deck. Each card is inserted into its proper location by moving it up and moving all larger elements down. When you reach the end, the deck will be sorted.

On the graphic display, each red element in turn is moved to its proper place and then turned blue.

The execution time for an insertion sort of randomly ordered data is also roughly proportional to the square of the length of the list (i.e., $O(N^2)$). However it is still considerably faster than a bubble sort because it uses fewer comparisons and fewer assignments.

Furthermore, the insertion sort has a nearly linear execution time (O(N); proportional to the length of the list) when applied to lists that are nearly in order. Compare the insertion sort to the others using ordered or nearly ordered data. The insertion sort is at its worst when applied to lists that are reversed or nearly reversed.

Selection Sort

To sort the cards using a selection sort, find the card with the smallest value and move it to the top of the deck. Now find the card with the next-smallest value and move it to the second position in the deck. Then take the card with the third smallest value and move it to the third position. When you reach the end of the deck the cards will be in order.

Values are yellow as they are being tested, and the current minimum is blue. When the entire list has been scanned, the blue element is swapped with the element at the top of the unsorted portion of the list.

Like the two previous sorts, the execution time of a selection sort is $O(N^2)$. Even so, it is still significantly faster than a bubble sort. Furthermore, it has no worst case situations. While the selection sort requires the same number of comparisons as the bubble sort, the number of assignments is much smaller. In fact, the selection sort requires fewer assignments than any of the other sorts. Because of this, the selection sort's best case situation is when the records in a file are quite large but the key values are small. In this situation, the selection sort execution time becomes nearly linear: O(N).

A bubble sort causes high values to sink and small values to rise to the top.

Shell Sort

Reshuffle the deck and spread it out on the table as before, only this time spread them *face down*, so you can see only the backs.

The Shell sort works by sorting only a selected number of cards during each pass. The cards to be sorted are determined by any of a number of mathematical series of integers.

The series we're using looks like this: 1, 4, 13, 40, 121. . . During the first pass, the calculated number is 40, so turn over every 40th card. Now, you'll have two cards showing (the first and the 41st). If the card on the left has greater value than the card on the right, swap them.

Turn the cards face down again. Now turn over the second card and the 42nd card. Swap them if necessary, and replace them (face down). Then compare the third and the 43rd and so on. During the pass, you should have only two cards face up at any one time. Continue doing this until you've checked the 12th and the 52nd cards. At this point, you'll have reached the end of the deck and the end of the first pass.

The next lowest number in our series is 13. Turn over the first and 14th cards, compare and swap them if necessary, then turn them back face down. Next, turn over the second and 15th cards, compare and swap them if necessary. Continue comparing two cards thirteen spaces apart until you've compared the 13th and 26th cards. Now go back to the begining of the deck and turn over the first, 14th and 27th cards. If the 27th card has a smaller value than the 14th card, swap them and then compare the first and 14th card, swapping them if necessary. If the 14th card is already smaller than the 27th card, you don't need to compare the first and 27th card since the first and 14th cards are already in order. (Editor's note: *This is a slightly modified version of the Shell sort.*)

Next, compare the 2nd, 15th and 28th card in the same manner. Continue until you have compared the 13th, 26th and 39th card. Now go back to the beginning of the deck and turn over the 1st, 14th, 27th and 40th cards. Repeat the same procedure as before, that is, compare the 27th and 40th cards; if the 40th is smaller swap it with the card in the 27th position and then compare it with the 14th card. Since everything except the last card is in order, you can stop comparing cards when the 40th card is in its correct position. Continue with cards in the 2nd, 15th, 28th and 32nd positions, then 3rd, 16th, 29th

and 33rd and so on until the cards in positions 13, 26, 39 and 52 are in order.

The next number in our series is 4, so sort the 1st and 5th numbers, the 2nd and 6th, 3rd and 7th and 4th and 8th. Now sort the 1st, 5th and 9th cards, the 2nd, 6th and 10th cards and so on. When you are finished the list will be very nearly sorted. The final run through the deck, with elements one apart, amounts to a very fast insertion sort.

The program colors the elements it is sorting blue. The last element is colored yellow since it is not yet in its proper relative position. The yellow element will move up as it is inserted into its proper place. The program then moves on to the next list of numbers, continuing until the list is sorted.

No one has yet been able to mathematically analyze the Shell sort in order to determine its execution time, although based on timing results it seems to be $O(N^{1.25})$. This is significantly better than any of the first three sorts in general. One of the nicest features of a Shell sort is that it is not subject to extreme worst case situations. That is, the execution time is essentially the same regardless of how the list is initially ordered. It's an excellent choice for a general purpose sorting routine.

Quick Sort

The quick sort, also known as a partition exchange sort, is fastest on random lists.

Shuffle the deck and lay it out face up. The last card is the "pivot" card. Find the first card from the beginning of the deck greater than or equal to the pivot value and the first card from the end of the deck less than or equal to the pivot value and swap them. Continue the search from the top for a larger element and from below for a smaller element and swap them. Since these two searches are going in opposite directions they will eventually cross; when they do, swap the pivot value with the value at the crossing point. At this point, all values above the pivot are less than or equal to it and all values below it are larger. Ideally, this should split the deck roughly in half.

Apply the same process to the top half of the list and then to the bottom half. Each, of course, will also be broken into two parts, and so on. As the sublists become smaller and smaller, they will eventually get to the point where they contain only one element. Such a list is (by definition) sorted so you can go on to the next sublist.

See Sorts initially colors the last element yellow. As it searches for larger and smaller elements, the value being checked or swapped is colored yellow. When an element is moved into its correct pivot position, it is blue.

The execution time of quick sort on randomly ordered lists is $O(N*\log(N))$ where the logarithm is base two. This is superior to even the Shell sort. However, when the list is ordered or nearly ordered (or reversed or nearly reversed) the execution time becomes $O(N^2)$. For such lists a Shell sort will perform better.

Conclusion

See Sorts should lift some of the mystery surrounding sorts—watching each comparison and substitution *as it is happening* will give you an intuitive grasp of what the program is doing. Not only will you have a better idea of how to write your own sorting routines, you'll be able to compare the sorts to see which is best for your program before you even start coding. Even if you're not a programmer, running See Sorts is an interesting way to see how programmers define problems so computers will be able to solve them.■

Delmar E. Searls wrote Grapher and 3-D Grapher in the Fall 1987 issue of START.

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This column opens a new promotional avenue for SubLOGIC, a small engineering-oriented company dedicated to producing the finest in flight simulation software. Please tune in to "Flight Notes" each month for the latest on SubLOGIC software, new product announcements, and product add-on information.

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An American Sampler

by Robert Neumann

ROBERT KOPECKY

Thinking of copying someone else's sound for your next MIDI masterpiece? Think again: you may be violating a number of copyright laws. The widespread practice of digitally "sampling" parts from original works has cost musicians thousands of dollars in royalties. START's commitment to MIDI is so strong that we decided to reprint the following article, originally published in the May 1988 issue of* Omni *magazine. It discusses one way musicians are fighting back: music fingerprinting.

At age thirty-four, music programmer John Mahoney has decided to become a part-time private investigator, a "music fingerprinter" who can electronically determine whether one musician has reproduced sounds from another musician's copyrighted recording. Mahoney's business isn't booming—yet—but he may testify in two copyright infringement cases pending in New York, and other cases are undoubtedly on the way.

In his windowless basement studio jammed with state-of-the-art recording equipment that he uses for his own musical compositions, Mahoney demonstrates how digital sampling makes stealing sounds possible. Digital sampling is done using an electrical device called a sampler, which converts sounds into digital recordings that are stored on computer disks. "I can capture any sound in the universe with digital sampling," says Mahoney. "Once I've sampled [digitally recorded] a sound, I can play it, alter it, do whatever I want to it." Indeed, such digital doctoring has given modern musicians the ability to insert almost any sound—even James Brown's voice—onto one of their own pieces.

Mahoney shoves a floppy disk containing previously sampled sounds into a disk drive and, using the Rolls-Royce of samplers—the Synclavier—he selects timpani from a timbre directory on the monitor. When he strikes a key on the Synclavier's piano keyboard, the sound of a deep-bellied drum resounds from massive wall speakers. He can do the same for any note from any instrument. In fact, he can vary the pitch of each note and stretch and shorten the sounds. Mahoney leans back in his chair and clasps his hands behind his head. "I can incorporate any isolated sound into my palette and mix those sounds into my own creation," he says.

The reproduction of isolated sounds is widely accepted in the music business. Music programmers build large libraries of individual sounds, everything from a note played on an unusual African folk instrument to one that flies off Phil Collins's snare drum. "Part of what you're hired for are your sounds," says Mahoney, who was one of the first musicians to enter the field of music programming when the Synclavier first became popular in 1985. In building a library, programmers may buy sounds from the musicians who created them or sample sounds from compact disks. But that's where Mahoney draws the line. "You could use this technology to cop a melody or rhythm," he explains, "maybe cut up someone else's horn phrase and fly it into your own composition. I don't do that."

Others do copy longer passages, though, and that's where Mahoney's detective work comes in. When he is asked to fingerprint sounds, he must first identify the two passages to be compared. The suspected passage will usually be something that the aggrieved musician thinks sounds "too familiar." That same musician, though, might not remember where the passage occurs in his own composition. Mahoney has to find it and determine if it is a likely candidate for sampling. A sound buried among other instruments or voices is extremely difficult, often impossible, to isolate: It just can't be separated from the other sounds. "But," says Mahoney, "if the sound is laying out in the open and I find it on the other musician's recording, that's a good indication it was lifted."

Often the samples he examines have other sounds added to them. A horn phrase, for example, might be surrounded by drums. "Then," says Mahoney, "I have to try to filter out what's around the sound. I can get rid of some frequencies, but often they cross over each other, and there's not much you can do."

Once the original and suspect sounds have been isolated, Mahoney uses the Synclavier to graph the characteristics of each sound. After matching the two starting points and setting the opening pitches to match each other, he programs the Synclavier to graph the relative amounts of each frequency that appear in the sounds. If he finds that the two sounds match, it's a clear case of copying.

It looks likely that Mahoney will take the stand for the first time later this year in one or two infringement suits pending against the Beastie Boys in New York. The rap group is currently being sued for copyright infringement for several songs on their album *Licensed to Ill*. The plaintiffs hope that testimony from a music fingerprinter will bolster that of musicologists, who are traditionally called as expert witnesses in copyright infringement cases. If the court accepts music fingerprinting as viable evidence, the door will be open for more suits. But acceptance of music fingerprinting will also mean that the courts will have to grapple with some new and decidedly sticky problems: The sounds Phil Collins gets out of his snare drums are his, or are they? Can a programmer lift one or two of those sounds without infringing on Collins's copyright? In a profession where legal limits have yet to be set, these cases may determine to what extent the recording industry is licensed to sample.

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(Editor's note: *Several cases, including the one involving the Beastie Boys, are still pending in a U.S. District Court. Also, a decision is yet to be made concerning the use of music fingerprinting as admissible evidence.*) ■

Robert Neumann is a novelist and Hypercard software developer living and working in New York City.

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Requires: Color monitor

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STO224

3D Fonts II™
by Doug Thomas ©1987
Requires: CAD-3D 1.0 or CYBER STUDIO
STO254

Human Design™
by Richard Berry ©1986
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STO242

Video Titling Design™
by Maurice Molyneaux and Andy Eddy ©1987
Requires: CYBER STUDIO; CYBER CONTROL™ recommended; CYBER PAINT™ for special f/x
STO261

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by Darrel Anderson ©1986
Requires: CAD-3D 1.0 or CYBER STUDIO
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by Darrel Anderson ©1988
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STO262

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Create virtually any known molecule using the online periodic table of elements. Load and display amino acids, hydrocarbons, and sugars. Create your own molecules on screen. Output molecules as CAD-3D objects, or as DEGAS*/NeoChrome* pictures. Or, explore X-Ray Crystallography. *Requires: One megabyte RAM.*
STO239 $79.95
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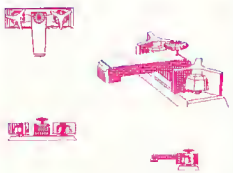

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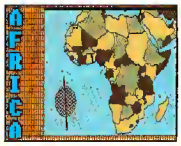

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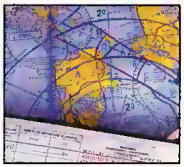

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ST Telecommunications

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by Adrian Jovanovich

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If the bugs don't kill you, the quake sure will. This is a new planet, and BIG! Fresh from that black hole. It's unstable and ready to blow! To make matters worse, you don't know where the planet's core is located, or what the nine elements are. And there's these *things* floating around that suck the energy right out of you when they pass by, not to mention those whirly-slicer doobads with blades, and weird artifacts everywhere. You could get stuck wandering around the alien-infested caverns for years without finding your way out, if you should live that long (but you won't).

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- Beautiful animations

Requires: Color system and joystick

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by Shelbourne Software

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STO402 $24.95

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